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SIXTY-FIRST ANNUAL REPORT

of

The Maine
Agricultural Experiment
Station

ORONO, MAINE

1944-1945

UNIVERSITY OF MAINE

1944-1945

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MAINE AGRICULTURAL EXPERIMENT STATION

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BULLETIN 427

EARLY HARVESTING OF HEALTHY SEED POTATOES FOR THE CONTROL OF POTATO DISEASES IN MAINE

E. S. SCHULTZ,¹ REINER BONDE,² AND W. P. RALEIGH³

INTRODUCTION

The State of Maine produces approximately 164,000 acres of potatoes annually. This acreage requires nearly 3,000,000 bushels of seed potatoes for planting. Such a large quantity of good seed is usually not readily available so that much inferior seed often is planted. Inferior seed potatoes give smaller yields and in addition decrease the quality of the crop because of net necrosis (caused by the leafroll virus in certain varieties), ring rot, or other diseases. Disease in seed potatoes is one of the most important problems that confront the potato growers of Maine. Often a grower or buyer purchases seed potatoes considered to be of high quality and finds later that they were badly diseased. The resulting crop is a disappointment and is injurious to our potato industry.

The problem of securing good seed potatoes has been especially acute in Maine since the serious leafroll epidemic of 1938 resulting from an unusual amount of spread of the disease in 1937. Since then the control of leafroll has been more difficult for the growers of certified seed potatoes, as well as for the growers of table stock. Other virus diseases have remained more or less important.

Shortly after the discovery about 25 years ago that virus diseases were important in potatoes, seed plots were started with the hope that they would give the greatest possible reduction in losses caused by virus diseases, including leafroll, mosaic, and spindle tuber. Seed plots have been found to vary in their effectiveness in virus-disease control, according to the degree of isolation from other

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potatoes, the amount of virus disease present, location, thoroughness and time of roguing, and earliness of planting (4, 5).

Progress in seed-plot methods has been recorded in a number of previous publications by Folsom and Schultz (6), Folsom, Schultz, and Bonde (7), Schultz, Bonde, and Raleigh (8), Simpson (11), Simpson, Libby, and Wyman (12), Folsom (5), and Simpson and Porter (13).

One phase of control that has recently assumed greater importance is "early harvesting." This consists of killing or removing the tops and digging the tubers early in the growing season before viruses that are introduced into the foliage by insects or other means have had time to reach the tubers. In early harvesting the grower may run into certain difficulties such as the lateness of ring-rot symptoms, the great amount of labor needed to pull the tops, and the danger of late-blight rot when late blight ("rust") is present on early-harvested plants.

This bulletin records some of the benefits derived from early harvesting and discusses some of the difficulties involved.

PRELIMINARY EXPERIMENTS ON THE SPREAD OF VIRUS DISEASES IN SEED STOCKS HARVESTED AT DIFFERENT DATES, 1925 TO 1927

Schultz and Folsom, working in Aroostook County, Maine, found in 1918 that less of the virus diseases was present in seed potatoes if they were harvested before aphids were abundant (9, p. 332). They also found in 1919 that the maximum amount of disease is avoided if the potatoes are dug within 10 days of the maximum infection by the transmitting insects (10, p. 97). Further studies in 1923 and 1924 showed that the greatest spread of the virus diseases occurred after the first week of August (7, tables 12 and 15).

During the years 1925 to 1927, inclusive, experiments were conducted in Aroostook County, Maine, to obtain additional information regarding the dates during the season when the virus diseases are spread most extensively. It was thought such data would indicate the time that commercial seed plots should be harvested to avoid becoming contaminated with the virus diseases that are disseminated by insects.

For this experiment, blocks of seed potatoes infected with mild mosaic, leafroll, and spindle tuber were planted in different parts of a field of healthy potatoes. Both the diseased and the healthy seed stocks used for this experiment were of the Green Mountain variety. At approximately 10-day intervals beginning August 1 tubers were harvested from the healthy plants by taking one tuber from a hill in the rows that were adjacent to rows with diseased plants. These were put into storage and planted the following spring to determine the extent to which they had become infected as a result of being exposed to the respective diseases. This procedure gave an index of the relative amount of virus-disease spread which had occurred at the different harvesting dates during 1925 to 1927.

The results of this experiment have been summarized in table 1. The data show that in most cases mild mosaic was absent from seed potatoes harvested before the tenth of August and that dissemination increased as the season progressed. Spindle tuber also was absent from seed stock harvested before the tenth of August. In 1925, however, spindle tuber did occur in the seed that had been harvested after August 10. In 1927, 2 per cent spindle tuber had been disseminated to the healthy plants dug at the time of the first killing frost. Leafroll was not disseminated during the 3-year period covered by this experiment.

EARLY-HARVEST SEED PLOTS ON AROOSTOOK FARM, PRESQUE ISLE, MAINE, 1935 TO 1943

In 1935 an experiment was begun to determine the extent to which different strains of seed potatoes could be maintained in a virus-free condition by careful roguing of the seed plot and then pulling the vines and harvesting the crop before aphids became abundant. A strain of Triumph and two strains of Green Mountain potatoes were used for this experiment. The seed plot was not well isolated, since it was only 200 to 1,000 feet from commercial fields infected with different virus diseases. The seed plot was planted by hand as early in the season as was possible, with early-harvested potatoes selected from the seed plot the previous season. The smallest tubers were planted whole and the larger ones were cut

and planted in tuber units.⁴ When the plants were 3 to 6 inches tall, which was about the last week in June, and every week during July the seed plot was inspected for diseased plants. These were dug and, along with the seed pieces and new tubers, were placed at once in a close-mesh bag and removed from the plot.

TABLE 1

Mild Mosaic, Leafroll, and Spindle Tuber in Green Mountain Field-exposure Plots¹ harvested at different dates, Aroostook Farm, Presque Isle, Maine, 1925 to 1927

Dates harvested	Disease for different years ²								
	1925			1926			1927		
	Mild mosaic	Leaf-roll	Spindle tuber	Mild mosaic	Leaf-roll	Spindle tuber	Mild mosaic	Leaf-roll	Spindle tuber
	%	%	%	%	%	%	%	%	%
August 1 to 10	0	0	0	0	0	0	4	0	0
August 11 to 20	15	0	7	9	0	0	36	0	0
August 21 to 30	30	0	11	34	0	0	46	0	0
August 31 to September 10	31	0	13	72	0	0	58	0	2
September 11 until killing frost	25	0	10	83	0	1	—	—	—

¹ Rows of healthy potato plants were grown adjacent to blocks of diseased plants in the same fields.

² Percentages based on plants grown from 100 tubers harvested at each of the different dates for the respective diseases. The tubers were planted the following year for determining the extent of virus-disease spread.

The potato tops in the seed plots were pulled by hand before aphids had appeared and begun to disseminate the virus diseases. The tops were pulled the last week of July or the first week of August or as near to this time as the conditions permitted. Hills were dug and kept separate and the following year planted as hill units. If any plant in a hill unit showed disease the entire unit was discarded.

The data secured from this experiment are recorded in tables 2, 3, and 4. Table 2 records the results obtained with the Triumph variety.

⁴ Many small tubers result when the crop is harvested early in the season. Such tubers weighing about 1 ounce or less were planted without being cut. The larger tubers were cut into as many seed pieces as the size permitted, allowing approximately 1 to 2 ounces per seed piece.

It is very difficult to produce healthy Triumph seed potatoes in the concentrated potato area of Maine, because this variety is very susceptible to the virus diseases. The data in table 2, however, show that disease-free seed was produced in 6 of the 8 years that the experiment was conducted. In 1936 only 0.5 per cent mosaic was present and in 1937 only 2.9 per cent. In 1936 and 1937 a few aphids were observed in the seed plot at the time the potatoes were harvested. In 1937 a badly diseased commercial field was located approximately 200 feet away.

In only 1940 and 1941 were tubers harvested late in the season. Those harvested on September 20, 1940, had 48 per cent severe mosaic and 65 per cent leafroll, those harvested September 24, 1941, had no mosaic but had 44 per cent leafroll. These high disease percentages show that the virus diseases had been disseminated extensively the latter part of 1940 and 1941 and that the practice of harvesting the crop early while aphids were still few was of great benefit in controlling the spread of the diseases.

TABLE 2

Mosaic and Leafroll in the Triumph Variety Grown in Tuber-unit Seed Plots, Aroostook Farm, Presque Isle, Maine, 1935 to 1942

Year ¹	Date harvested	Hills in sample	Virus disease in sample
		Number	Per cent
1935	August 1	537	0.0
1936	August 7	187	.5
1937	August 7	174	2.9
1938	July 28	220	.0
1939	August 3	240	.0
1940	July 31	270	.0
1940	September 20 ²	200	48.0 mosaic 65.0 leafroll
1941	July 31	144	.0
1941	September 24 ²	100	44.0 leafroll
1942	July 25	144	.0

¹ The tubers were harvested on the given dates and planted the following year to determine the percentage of virus diseases.

² Harvest at time of killing frost.

Table 3 gives a summary of the amount of virus-disease spread that occurred in a Vermont strain of Green Mountain potatoes that was propagated in the experimental seed plot for the 9-year period 1935 to 1943.

TABLE 3

*Mosaic and Leafroll in a Vermont Strain of Green Mountain Grown in
Tuber-unit Seed Plots and Harvested at different dates, Aroostook Farm,
Presque Isle, Maine, 1935 to 1943*

Year ¹	Date harvested	Hills in sample	Disease in sample	
			Mosaic	Leafroll
		Number	Per cent	Per cent
1935	August 1	1,449	0.0	0.0
1936	August 7	1,443	.2	.0
1937	August 7	1,533	.5	.8
	August 13	100	4.0	1.0
	August 25	100	16.0	25.0
1938	July 27	1,246	.0	.0
1939	August 3	1,080	.0	.0
	August 13	100	.0	.0
	August 23	100	2.4	.0
	September 3	117	5.0	2.5
	September 29	116	6.8	1.7
1940	July 31	1,056	1.0	.0
	August 31	100	2.0	2.0
	September 11	100	.0	2.0
	September 20	100	72.0 ²	16.0
1941	July 31	1,080	.0	.0
	August 8	383	.0	3.0
	August 28	106	.0	15.0
	September 7	177	.0	23.0
	September 24	139	.0	31.0
1942	July 25	1,030	.0	.0
	August 5	197	.0	.0
	August 16	200	.0	.0
	August 27	190	3.7	2.6
	September 8	170	4.2	9.4
1943	August 6	300	.0	.0
	August 16	200	.0	.0
	August 28	100	.0	.0
	September 8	100	.0	1.0
	September 29	100	1.0	2.0

¹ The tubers were harvested on the dates indicated and planted the following year for determining the extent of virus-disease spread, except for the 1943 samples which were planted in a greenhouse.

² Mostly rugose mosaic caused by a combination of the X virus with the Y virus.

The data in table 3 show that the earliest date of harvest varied from July 25 to August 7 for the different years. This early harvesting prevented the spread of virus in 6 of the 9 years, and the spread was relatively slight in the other 3 years. For instance, in 1936 only 0.2 per cent of the early-harvested seed stock contained mild mosaic, and in 1937 0.5 per cent of that harvested on August 7 had contracted mild mosaic and 0.8 per cent had leafroll. In 1940

1 per cent of the stock harvested July 31 had mosaic. In 1940 a badly diseased field was located only 200 feet from the experimental seed plot, and aphids were present before the potatoes were dug, which no doubt accounts for the early spread.

It should be noted that there was no disease in the seed stock that was harvested as late as August 13, 1939, August 16, 1942, or August 28, 1943. In 1942 the virus diseases were present, however, in the August 27 harvest. The spread of virus diseases was relatively small in 1943 even when the seed stock was harvested as late as September 29.

The data show that there was little or no disease in a sample

TABLE 4

Mosaic and Leafroll in a Maine Strain of Green Mountain Potatoes Grown in Tuber-unit Seed Plots and Harvested at Different Dates, Aroostook Farm, Presque Isle, Maine, 1935 to 1943

Year ¹	Date harvested	Hills in sample Number	Disease in sample	
			Mosaic Per cent	Leafroll Per cent
1935	August 1	1,210	0.00	0.0
1936	August 7	1,026	.00	.0
1937	August 7	1,023	1.60	.5
1938	July 28	914	.00	.0
1939	August 3	1,218	.00	.0
	August 13	200	.00	.5
	August 23	200	.00	1.5
	September 3	108	2.70	.0
	September 29	100	2.60	.0
1940	July 31	1,290	.08	.0
	September 20	100	35.00 ²	33.0
1941	July 31	1,380	.00	.0
	August 8	440	.00	.9
	August 28	100	2.00	10.0
	September 7	100	5.00	20.0
	September 24	100	20.00	30.0
1942	July 25	1,521	.00	.0
	August 5	440	.00	.0
	August 20	100	2.00	10.0
1943	August 6	100	.00	.0
	August 16	100	.00	.0
	August 28	100	1.00	.0
	September 8	100	1.00	.0
	September 29	100	1.00	2.0

¹ The tubers were harvested on the dates indicated and planted the following year for determining the extent of virus-disease spread.

² Mostly rugose mosaic caused by a combination of the X virus with the Y virus.

if it was harvested by the first week of August; that the amount of virus disease increased as the season progressed; and that by late August and during September stocks were in most cases badly infected.

Table 4 shows the percentage of mosaic and leafroll that was present in another strain of Green Mountain potatoes when harvested at different dates. The data show that mosaic and leafroll were absent in the early-harvested crop in 7 of the 9 years included in the experiment.

In 1937, when a diseased commercial field was only 200 feet away, the seed stock harvested on August 7 had 1.6 per cent mosaic and 0.5 per cent leafroll. In 1940 when a field of diseased potatoes was nearby, the seed stock harvested on July 31 had 0.8 per cent mosaic but no leafroll.

Seed potatoes were harvested in the experimental seed plot at two or more successive dates during the years 1939 to 1943, inclusive. Here again the percentage of virus disease in the seed stock increased as the season progressed. In 1940 the July 31 harvest had only 0.08 per cent virus disease but the September 20 harvest had 35 per cent mosaic and 33 per cent leafroll. In 1941 the July 31 harvest had no mosaic or leafroll, the August 8 harvest had only 0.9 per cent leafroll, but the September 24 harvest had 20 per cent mosaic and 30 per cent leafroll.

In 1943 aphids were not very abundant. By August 16 mosaic and leafroll had not spread into the early-harvested seed plot, by August 28 and September 8 only 1 per cent mosaic was present, and by September 29, 1 per cent mosaic and 2 per cent leafroll were present. The data for 1943 show that in years when aphids are few harvest may be delayed until the middle of August.

TRIALS OF EARLY HARVESTING CONDUCTED IN COOPERATION WITH FARMERS

EXPERIMENTAL SEED PLOTS

The question naturally arose as to whether the favorable results obtained by the early-harvesting method on Aroostook Farm also could be obtained on other farms in Maine. Early-harvest seed plots were established in cooperation with farmers

located in eight different localities and, with one exception, were not well isolated. Under the supervision of the Maine Agricultural Experiment Station⁵ they were planted, rogued, and harvested in general accordance with the methods described in the later section on recommendations. Early harvesting was done between July 25 and August 5 and late harvesting after killing frost. In table 5 the results obtained from these seed plots are recorded.

The data in table 5 show that in all cases early harvesting reduced materially the amount of disease. In no instance did the early-harvested seed potatoes have more than a total of 1.6 per cent virus disease. Twenty-one seed plots were conducted during the 4-year period, and in all cases the early-harvested seed potatoes harbored considerably less disease than the late-harvested. Mosaic and leafroll were entirely eliminated in 13 of the 21 seed plots, and the total amount of virus disease in the others was relatively small, varying from 0.2 to 1.6 per cent.

TABLE 5

Virus Disease in Green Mountain Seed Stocks Produced in Different Localities by the Early-Harvest Seed-Plot Method, 1934 to 1937

Location	Disease in seed stocks for different years ¹							
	1934		1935		1936		1937	
	Early harvest ²	Late harvest ³	Early harvest ²	Late harvest ³	Early harvest ²	Late harvest ³	Early harvest ²	Late harvest ³
	%	%	%	%	%	%	%	%
Masardis	0.0	0.4	0.0	0.5	0.0	0.0	0.0	0.0
New Canada	—	—	.0	2.6	.2	1.0	0.5	3.0
New Sweden	—	—	.9	8.0 ²	.0	2.3	—	—
Presque Isle	.6	4.0	.0	2.4	.0	.8	.0	4.0
Sherman Mills	.0	2.1	.0	.2	—	—	—	—
Smyrna Mills	1.6	6.0	1.5	7.6	—	—	—	—
Spaulding	—	—	.9	1.7	.0	.0	.6	1.0
Winterville	—	—	.0	2.4	—	—	—	—

¹ Includes mosaic and leafroll.

² Early harvesting was done between July 25 and August 5.

³ "Late harvest" refers to harvests made after the time of killing frost.

FARMERS' SEED PLOTS

It was considered by many that the production of good seed potatoes by the early-harvesting method would not be practical

⁵ Supervised by W. F. Porter, G. W. Simpson, and Reiner Bonde.

and, therefore, would not be adopted by the farmers.

A number of farmers in Maine, however, now make a practice of early harvesting enough seed potatoes each year to plant their seed plots the coming year. Some farmers have been so successful in growing good seed by this method that they now plant most of their acreage with such seed. Some have produced high-quality seed stocks for the past 10 to 15 years with no losses from leafroll, mosaic, spindle tuber, or ring rot.

CONTROL OF RING ROT IN EARLY-HARVEST SEED PLOTS

Any good seed-improvement program for Maine must take into consideration the control of ring rot. Unfortunately this disease often is not readily detected at the time the early-harvested seed plot is dug. Studies have shown, however, that a seed stock was nevertheless easily maintained free from this disease, provided the initial stock was free from ring rot and precautions were taken thereafter to prevent it from becoming contaminated.

In the experiments reported here one strain of Triumph and two strains of Green Mountain have been propagated free from ring-rot infection since 1935 on Aroostook Farm where the tests with ring rot were also made. It should be mentioned also that ring rot was absent in the potatoes grown on the farmers' early-harvested seed plots previously referred to in this bulletin.

Furthermore, certain growers have maintained the same seed stock free from ring rot and with a minimum amount of virus diseases for nearly 20 years, because their seed potatoes were free from ring rot when their seed-plot program was begun, and they permitted no seed stocks that were infected to be brought to their farms. The spread of the virus diseases was controlled by adopting the early-harvesting methods. More detailed information regarding ring rot is available in Maine Agricultural Experiment Station Bulletin 396 and Maine Agricultural Extension Bulletin 286 (1, 3).

KILLING TOPS WITH WEED-KILLING PRODUCTS FOLLOWED BY HARVESTING WITH MACHINE

The potato vines of the early-harvested seed plots, to which reference has been made previously in this bulletin, were pulled by hand. This method of destroying the tops is very tedious, time-consuming, and expensive and therefore has not been adopted by many farmers. Many more growers would conduct early-harvested seed plots if an easy and economical method were available for killing the potato tops.

Some growers have attempted to harvest their seed plots by the use of machine diggers while the tops were still green in order to overcome the problem of pulling the tops. This method is very precarious, however, because a large part of the crop may be lost from late-blight tuber rot if the plants have even a trace of late blight or "rust" on the foliage.

In 1940 two commercial growers who dug their seed plots while the tops were green experienced no loss from late-blight rot, and the potatoes kept well in storage. In 1941, however, they lost most of their early-harvested seed potatoes because the plots were dug while the foliage was green and slightly infected with late blight. In 1943 approximately 50 per cent of the tubers from another seed plot decayed because they were dug while the foliage was infected with late blight. Farmers, therefore, are warned not to harvest their potato crop until the plants are dead and there is no danger of contaminating the potato tubers with the late-blight organism.

Spraying with a solution of sulfuric acid has been successfully used in Europe to kill potato tops and to hasten the maturity of the tubers. A sulfuric acid solution of approximately 6 to 7 per cent by weight was found to be effective (2, pp. 173-175), but is very toxic and dangerous to handle and therefore its use has not been recommended in Maine.

A concentrated copper sulphate solution (35 pounds in 100 gallons of water) when applied with a horse-drawn wheel-traction sprayer did not kill potato foliage sufficiently in 1935 and 1936 to recommend it for killing tops on the early-harvested seed plots. It is used by some growers, however, for spraying partially green potato fields just prior to harvesting the crop, the claim being made that this practice eliminates late-blight tuber decay.

Sinox⁶ and Elgetol⁶ when used at concentrations of 1 gallon in 100 gallons of water only partly killed potato tops in preliminary experiments conducted in 1941.

The following materials and formulas were used in experiments for killing potato tops on Aroostook Farm in 1943:

1. Sinox⁷ (2 gallons) and ammonium sulfate (10 pounds) in 100 gallons of water; applied at the rate of about 135 gallons per acre.
2. Handy Killer,⁸ 4 pints per 100 gallons of water; applied at the rate of about 135 gallons per acre.

Both of these preparations killed Green Mountain potato tops satisfactorily. Handy Killer acted somewhat more slowly than Sinox but was satisfactory. Some commercial growers also claim good results with the Handy Killer solution. Sinox with ammonium sulfate killed the tops quite rapidly, dying becoming evident a few hours after the material had been applied.

TREATING FRESHLY DUG POTATO TUBERS FOR THE CONTROL OF LATE-BLIGHT DECAY OF TUBERS

It has been shown previously in this bulletin that there is great risk of the tubers rotting in storage when harvested while the foliage is still green, if late blight is present. An experiment was, therefore, conducted for the purpose of determining whether it is possible to reduce the amount of late-blight tuber decay by killing the tops before harvest or by treating the freshly dug tubers with certain disinfectants.

The foliage of a Green Mountain potato field was permitted to become infected with late blight or "rust." A part of this field was then sprayed twice with a Sinox and ammonium sulfate solution in order to kill the tops and destroy the late-blight fungus. Parts of the same field were not sprayed. An early and a late

⁶ Manufactured by Standard Chemical Products, Inc., Hoboken, N. J.

⁷ The active ingredient in Sinox is said to be the sodium salt of dinitro-ortho-cresol.

⁸ A sodium arsenite liquid product sold locally as a "bug" poison and for the purpose of killing potato tops.

harvest were made of both the sprayed and unsprayed plots. The early harvest was made with a tractor-powered machine 2 days after the Sinox and ammonium sulfate spray had been applied.

The freshly dug tubers were picked into wooden slatted crates and treated immediately in the field by the instant dip method or for 5-minute periods in a formaldehyde solution (1 pint in 30 gallons of water) and a weak Bordeaux mixture (3-3-100). Each treatment was replicated five times, each lot consisting of approximately 50 pounds of tubers. The treated potatoes, as well as the untreated, were stored immediately in crates in an ordinary bin until they were examined 6 weeks later for late-blight decay.

The results of this experiment, recorded in table 6, show that approximately 37 per cent of the freshly dug tubers rotted in storage when neither the foliage was killed by the Sinox-ammonium sulfate spray nor the tubers treated with a disinfectant. Nearly 13 per cent of the tubers decayed when the tops were killed but the freshly dug tubers were not treated. The tops were not entirely dead at the time of harvest, and it seems possible that some late-blight spores were still viable which infected the tubers while they were being dug. The fact that 2.59 per cent of the crop decayed in the case of the plots on which the tops were killed and the crop dug late would indicate that some infection had occurred before the tops were killed.

TABLE 6

Effectiveness of Killing Potato Foliage and Treating Freshly Dug Seed Potatoes in Controlling Late-blight Tuber Decay

Treatment of potato foliage	Time of harvest	Treatment of tubers		Percentage of tubers with late blight rot
		Material	Length of time	
				Per cent
Sprayed with Sinox ¹	Early	Formaldehyde ²	Instant dip	3.54 ± 0.65
Do	do	do	5 minutes	4.70 ± .68
Do	do	Bordeaux mixture ³	Instant dip	5.85 ± .55
Do	do	do	5 minutes	8.99 ± 1.35
Do	do	-----	-----	12.89 ± .93
Do	Late	-----	-----	2.59 ± .09
Not sprayed	Early	Formaldehyde ²	Instant dip	2.59 ± .72
Do	do	do	5 minutes	2.26 ± .36
Do	do	Bordeaux mixture ³	Instant dip	4.45 ± .40
Do	do	do	5 minutes	4.77 ± .41
Do	do	-----	-----	37.20 ± 4.29
Do	Late	-----	-----	5.87 ± .56

¹ Manufactured by Standard Chemical Products, Inc., Hoboken, N. J. Used at rate of 2 gallons of Sinox and 10 pounds ammonium sulfate in 100 gallons of water, and applied at rate of 135 gallons per acre.

² Used at rate of 1 pint in 30 gallons of water.

³ Made according to 3-3-100 formula.

The results given in table 6 show that treating the tubers with either a formaldehyde solution or weak Bordeaux reduced the amount of late-blight infection. The instant-dip treatments appeared to be as effective in controlling the late-blight decay as were the 5-minute treatments. Formaldehyde was somewhat more effective in controlling the decay than was Bordeaux and injured the freshly dug tubers to a less extent. The Bordeaux treatment caused some burning and darkening on the bruised areas of the potatoes.

DISCUSSION

The production of seed potatoes that are relatively free from the virus diseases and ring rot continues to be an important problem in Maine. This problem has been especially acute since 1937 when a serious epidemic of leafroll and other virus diseases occurred.

By early harvesting, one strain of Triumph and two strains of Green Mountain potatoes have been kept relatively free from diseases for a period of 9 years on Aroostook Farm in plots located near virus-diseased potatoes. Ring rot also was absent from these seed plots during this period. It is believed that more growers could and should produce their own seed potatoes by growing them on a well-cared-for isolated seed plot which is harvested early in the season before aphids have become abundant.

The time of maximum virus-disease spread varies for the different seasons with the dates of maximum aphid infestation. The results of the experiments show that during favorable seasons for aphids the newly formed tubers may become slightly infected with leafroll and mosaic by August 1 in northern Maine. During seasons not favorable for the development of aphids these diseases may not reach the tubers until the middle of August or later. The experiments reported here indicate that the spread of leafroll and mosaic can normally be controlled by harvesting the healthy tubers July 25 to about August 5.

Ring rot was absent from the experimental seed plots conducted by the writers and also from the commercial seed plots referred to in this paper. Ring rot is very often disseminated through the purchase and introduction of new seed stocks by the

farmers. Growers would avoid this danger if they produced ring-rot-free seed potatoes on their own farms or purchased them from growers who conduct an early-harvest seed plot.

The seed plot should be planted as early in the season as the weather conditions permit so that 1- to 4-ounce tubers will be produced by the first week of August when early harvesting must be done to insure healthy seed potatoes in seasons of heavy aphid infestation. It is a good plan to plant the seed pieces shallow and to cover them lightly so that they will emerge quickly.

The early-harvest seed-plot method is considered by many to be too costly and therefore impractical for use under the conditions in Maine. However, it now seems to be the only way by which good seed stocks can be raised in the concentrated potato areas of Maine, and the extra cost involved is more than offset by the lessened cost in roguing the seed plots and the assurance that the seed potatoes will be relatively free from the virus diseases when finally sold or planted in the commercial field.

Although some seed-potato growers on well isolated farms have controlled virus diseases without early harvesting, a number of these growers find that by early harvesting the seed potatoes for their isolated seed plots they have practically eliminated these diseases from their farms.

Some growers who have tested this method are so well satisfied with the results that they now plan to early-harvest enough seed stock each year to plant most of their commercial acreage as well as their seed plots. Furthermore, a few growers who have employed this method or a modification of it have produced the highest quality of seed potatoes for a continuous period, in some cases nearly 20 years.

Killing the potato tops by hand pulling is laborious and time-consuming. This practice, however, prevents at once the virus diseases from reaching the tubers, whereas killing the tops before harvesting by machine permits tuber infection to occur from the living stalks that persist for several days after the leaves have been killed. In the absence of late blight, or when the foliage and the blight spores have been killed with weed-killing products, harvesting by machine can be successfully practiced and the tubers may be dug a few days after the leaves have been killed by spraying.

Potato tops were killed satisfactorily by spraying them with the Sinox-ammonium sulfate mixture and the Handy Killer in

the concentrations recommended. A 6- to 7-per cent sulfuric acid solution also killed the plants rapidly but is dangerous to use and therefore has not been recommended for use by farmers in Maine.

The problem of killing potato tops is being studied further by the Maine Agricultural Experiment Station, and recommendations will be supplied when the information is available.

Late-blight tuber rot resulting from early digging can be greatly reduced by treating the freshly dug tubers in a formaldehyde solution or weak Bordeaux solution. Studies are being conducted further to find other suitable treating solutions that can be used at time of harvest to disinfect immature potatoes for seed purposes.

METHODS RECOMMENDED FOR SEED-POTATO GROWERS

Farmers who intend to raise seed potatoes by the early-harvest seed-plot method should follow a rather definite procedure.

It is necessary to have a modern seed plot. The best seed stock that is available should be used, and it should be planted as early in the season as the weather permits so that fairly large tubers will be formed by the first week of August when the crop is harvested. The seed plot should be planted by the tuber-unit method and generally it is preferable to leave a one-hill skip between each tuber unit. Good isolation is recommended, although, as has been shown, good seed potatoes can be produced under poor isolation, provided the seed potatoes are harvested early in the season.

The seed plot should be thoroughly rogued for the virus diseases as early as possible, care being taken that no diseased hills or units are missed and that all the seed pieces are removed from the soil along with the diseased tops and not allowed to grow again. The diseased plants should be dropped at once into an insect-proof bag and carried from the seed plot before they have wilted and the aphids have had a chance to leave the diseased tops and infect the healthy.

The early-harvesting method also involves killing the foliage of the healthy plants in the seed plot before the virus diseases have become widely disseminated. Experiments have shown that the

potato tops should be killed not later than the first week of August to insure the best success in obtaining good seed under the conditions of northern Maine.

A convenient method of pulling the tops is to press the prongs of a hand digger or potato hook on the soil over the hill and then pull the stems between the prongs so that the tubers become detached and remain in the soil.

More recently it was found to be more convenient to kill the tops and the late-blight fungus by spraying with certain chemicals before the crop was harvested by machine.

Harvesting by machine, while the foliage is green, is less laborious than pulling the tops by hand or spraying to kill the vines. This procedure, however, involves great risk of tuber infection and decay caused by the late-blight fungus.

The tubers in the early-harvested seed plot are immature when dug and therefore must be handled carefully to avoid bruising. Picking the tubers into boxes or crates and storing them in these containers prevents much bruising. Little decay occurred provided the potatoes were stored in a cool cellar or bin under farm conditions.

SUMMARY

The control of leafroll and mosaic continues to be an important problem for Maine potato growers.

Tubers were harvested from tuber-unit seed plots on successive dates to determine the time the crop should be harvested in order to prevent the spread of the virus diseases.

The extent of the spread of the virus diseases increased as the date of harvest was delayed, there being little disease in the seed stock harvested from July 25 to the first week of August and usually a considerable amount of disease if the seed plot was harvested late in the season. Tubers harvested by the first week of August in experimental plots were relatively free from leafroll, mosaic, and spindle tuber.

The date of harvesting may be delayed until the second week of August or even later with very little virus infection of the seed stock, provided aphids are few or are absent.

A strain of Triumph and two strains of Green Mountain potatoes were maintained relatively free from the virus diseases for 8 and 9 years, respectively, by being grown on Aroostook Farm in an experimental seed plot which was early harvested each year before aphids had become abundant.

The early-harvest seed-plot method was successfully employed with eight experimental seed plots located in different parts of Aroostook County, Maine.

The early-harvest seed-plot method is practical and a number of farmers have maintained high-quality seed potatoes by its use for a period of 10 to 20 years.

Ring rot was not found in any of the seed potatoes referred to in this bulletin.

Farmers are warned not to harvest their seed plots while the foliage is green if late blight is present.

Hand pulling is an effective method of killing the potato tops for the early-harvest seed plot. The method, however, is very tedious, time-consuming, and expensive.

Potato tops were successfully killed in the experiments discussed in this bulletin by spraying with a solution of Sinox (2 gallons) and ammonium sulfate (10 pounds) in 100 gallons of water, or with Handy Killer (sodium arsenite), 4 pints in 100 gallons of water.

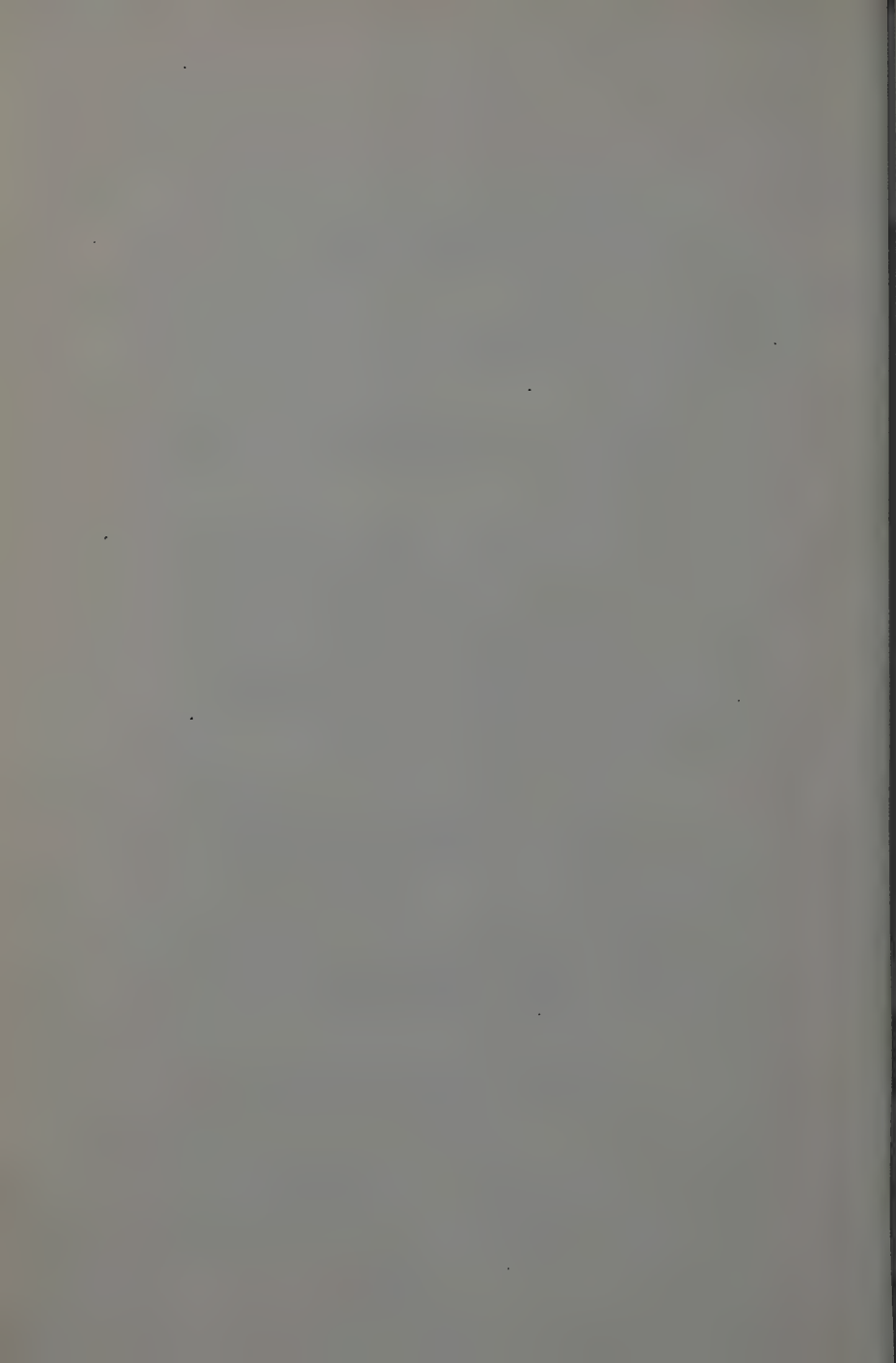
Treating freshly dug tubers with a formaldehyde solution (1 pint in 30 gallons of water) or a weak Bordeaux (3-3-100) greatly reduced the amount of late-blight decay of tubers.

If every potato grower in potato-growing regions, such as Aroostook County, Maine, would practice early harvesting of seed potatoes, as described in this bulletin, it is believed that ring rot would be eliminated and that leafroll, mosaic, and other virus diseases could be controlled so that epidemics of virus diseases would be very much reduced, if not prevented.

LITERATURE CITED

- (1) Bonde, Reiner
1939. Bacterial wilt and soft rot of the potato in Maine. Maine Agr. Expt. Sta. Bul. 396.
- (2) _____
1935. Killing of potato vines with sulfuric acid to hasten maturity.

- (In report of progress for 1935.) Maine Agr. Expt. Sta. Bul. 380: 173-175.
- (3) ———, and Wyman, Oscar L.
1941. Potato ring rot (bacterial wilt and soft rot). Maine Agr. Ext. Bul. 286.
- (4) Folsom, Donald
1939. Green Mountain seed plots. (In report of progress for year ending June 30, 1939.) Maine Agr. Expt. Sta. Bul. 397, pp. 788-792.
- (5) ———
1942. Potato virus disease studies with tuber-line seed plots and insects in Maine 1927 to 1938. Maine Agr. Expt. Sta. Bul. 410.
- (6) ———, and Schultz, E. S.
1926. Methods of conducting the seed plot and its importance in potato improvement work. Proc. Potato Assoc. Amer. for 12th Ann. Meeting, 1925, pp. 64-70.
- (7) ———, ———, and Bonde, Reiner
1926. Potato degeneration diseases: natural spread and effect upon yield. Maine Agr. Expt. Sta. Bul. 331.
- (8) Schultz, E. S., Bonde, Reiner, and Raleigh, W. P.
1934. Isolated tuber-unit seed plots for the control of potato virus diseases and blackleg in northern Maine. Maine Agr. Expt. Sta. Bul. 370.
- (9) ———, and Folsom, Donald
1920. Transmission of the mosaic disease of Irish potatoes. Jour. Agr. Res. 19: 315-337, 8 plates.
- (10) ———, and ———
1923. Transmission, variation, and control of certain degeneration diseases of Irish Potatoes. Jour. Agr. Res. 25: 43-117, 15 plates.
- (11) Simpson, G. W.
1940. Aphids and their relation to the field transmission of potato virus diseases in northeastern Maine. Maine Agr. Expt. Sta. Bul. 403.
- (12) ———, Libby, W. C., and Wyman, O. L.
1939. Seed potatoes for growers of table stock. Maine Agr. Ext. Bul. 259.
- (13) ———, and Porter, W. F.
1942. A roguing service for producers of foundation seed potatoes. Maine Agr. Expt. Sta. Misc. Pubn. 567.



BULLETIN 428

COMPOSITION AND USES OF BLUEBERRIES

F. B. CHANDLER

INTRODUCTION

The present interest in blueberries prompts the presentation of the results obtained at the Maine Agricultural Experiment Station in studies on the composition and uses of this fruit. The published results of many other investigators in this field, also, are discussed briefly where these appear to have a bearing on the subject at hand. The information here presented is principally for use in the home, but some possibilities for commercial adaptations of the results are suggested in footnotes and in the Appendix.

COMPOSITION OF BLUEBERRIES

The composition of blueberries has been studied by many investigators. Few, if any, of the investigators, however, have attempted a complete analysis of this fruit. The early studies were on the coloring matter (18)¹ and its identification (36), as blueberries, added to improve the color, were frequently an adulteration in wine. Ostermayer (34) states that blueberry wine is a natural source of iron and manganese and that it contains less phosphoric acid than is present in grape wine. Recently, many investigators have contributed information on the mineral content and food value of blueberries (see Tables 1 and 2 in Appendix A). Hodges and Peterson (19) showed that a serving of blueberries contains more manganese than does a serving of any other one of the 120 foods studied except wheat bran. Chandler and Highlands (9) and Nelson (33) have shown that most of the acid in blueberries is citric and part of the remaining acid is malic. Merriam and Fellers (28) have shown that the benzoic acid content in blueberries is low, being only 0.002 per cent. Blueberries have 9 to 10 per cent sugar, a small amount of protein and phosphorus, a fair amount of calcium, and a relatively large amount of iron. Chatfield and McLaughlin

¹ Reference is made by number to "Literature Cited" on p. 37.

(11) reported 310 calories per pound of fresh berries. The results of chemical analyses by the author and not previously reported are given in Table 1.

The vitamin content of blueberries has been studied by a few investigators and their findings are given in Tables 3 and 4. From the data available it is evident that the vitamin content varies with location and season. Bessey (5) has shown that there is about two and one-half times as much vitamin C in high-bush as in low-bush blueberries. While there are at least four vitamins in blueberries none of these is present in large quantity. Proper processing by canning or freezing does not destroy vitamin C (14). However, vitamin C is lost by prolonged cooking in an open kettle or by allowing berries to thaw some time before using.

USES OF BLUEBERRIES

The early records on the uses of blueberries are of little importance today, but they provide interesting reading. Dodoens in 1578 wrote of an apothecary preparation called *Rob* "...the which is good to be holden in the mouth against great drieth and thirst in hoat aques. . . (blueberries) doe also quenche thirste, and are good against all evil inflammation or heat of the blood." Gerarde in 1633 wrote a similar report and added "They be goode for a hot stomacke. . . ." (The above statements taken from Munson (31).) Early records show also that blueberry roots were used to make an infusion that was believed to cure the suppression of urine (27). Blueberry leaf extract has been used more recently to relieve diabetic patients (1, 45). This extract, called Myrtillin, appeared to have many merits, but it has not been generally recommended because a uniform product could not be developed.

A very good description of dyeing with blueberries was published in 1640 by Parkinson and quoted later by Munson (31). "With the juyce of the berries Painters do color paper or cards, to make a kind of purple blew colour, putting thereto some allome and Galles whereby they can make it lighter or sadder as they please." Blueberries were often made into wine or mixed with other fruits in wine making because of the resultant attractive color (3). The pigment of blueberries may be used as an indicator (46) as it is red in acid, colorless or pale yellow in neutral, and green in alkaline solutions.

Blueberries make excellent ornamental plants (2) and might be used more frequently in landscaping. These plants on the Pacific Coast are not only good hedge plants, but large quantities are shipped to the east coast for "green" with cut flowers. The high-bush blueberries of Maine have excellent fall color, a very delicate blossom, and the fruit frequently attracts birds. The low-bush varieties may be planted in many locations about the home for their spring blossoms and fall color. In some locations they may be used to cover slopes which are too steep to mow and where it is desirable to prevent soil erosion. In fact, they have been adopted for this purpose in many states and are being set in large numbers. Blueberry plants serve also as an excellent source of honey for bees. The honey from blueberry blossoms is light in color (26).

The most important use of blueberries is as a food where the fruit is eaten fresh, canned, frozen, or dried or as a juice, jelly, or a candied fruit. Heretofore only brief reports of the uses of blueberries as food have been published (37 and 47). As fresh berries they may be served alone or with other fruits, particularly bananas and peaches. The fresh berries may be obtained in Maine from the middle of July to the middle of September although most of the crop is harvested during August. The fresh berries may be stored² (8) for several months in the home refrigerator. For this purpose the berries should be firm and not overripe, and they should be handled as little as possible. They should be packed in pint or quart jars which are then sealed and placed in the refrigerator. Most satisfactory results will be obtained when the refrigerator temperature is 45 deg. F. or less. The berries should not be removed from the refrigerator until they are to be used. The fruit stored in this way may change somewhat in flavor while in storage and in some cases may actually improve.

Blueberries have been canned at home and commercially for over 75 years. The canned fruit should not be sealed until the contents of the container are 190 deg. F. or above. If blueberries are

² Commercially this may be accomplished by placing boxes of good quality, uncleaned berries close together in a gas tight chamber which can be kept at about 35 deg. F. Berries to be shipped to market should be removed and cleaned while still cool and packed in quart boxes. All of the berries in the storage should be taken out as soon as possible after the seal is broken. Commercially berries should not be kept more than 4 to 6 weeks before shipment. For details see Appendix B.

cooked in an open kettle this temperature can be obtained by putting the boiling sauce into sterile, hot jars and sealing them at once. With the cold pack method the containers should remain in a boiling water bath for 15 minutes. While sugar is usually added to the berries during the canning process, this is not necessary from the standpoint of the keeping quality of the product. Canned blueberries will keep for a long time, but the quality declines rather rapidly after a period of two years. Commercial canners of this fruit have greatly improved the methods of handling berries and of sanitation. The methods of packing are well known to all packers, therefore they will not be included here.

Freezing of blueberries has been practiced for some time commercially³ but this method of preserving is not adapted to home refrigeration. It may be practiced, however, where refrigerator locker storage is available.

The preparation of blueberry juice (9, 43) has been practiced for some time but this product could be more extensively used because of its pleasing color and body. The juice is prepared by cooking⁴ the berries until they are soft with just enough water to prevent burning. The cooked pulp is then drained in cloth bags. After draining, the juice remaining is pressed from the bags with a cider press or in a homemade press. A diagram and method for constructing such a press will be found in Appendix C.

³ Very little has been published on commercial freezing of blueberries and the Experiment Station has not conducted research in this field. However, Diehl *et al.* (12) and Moon *et al.* (32) have shown that there was a difference between varieties of the cultivated blueberries. The temperatures for freezing have not been published but they are usually frozen at -20° F. The type of container varies from the small pasteboard box holding one pound, used for quick freezing, to cans or boxes holding up to thirty pounds. In the large containers where air is used to conduct the heat away from the berries it is impossible to get quick freezing although it is frequently called quick freezing.

After freezing, blueberries should be stored at 15° F. or below (12, 41). The bacterial content of frozen blueberries is not high (41) but as freezing does not kill all bacteria the fruit should be used soon after thawing. Vitamin C is not lost by freezing (30), but it may be lost soon after thawing.

⁴ Commercially it would be desirable to use a jacketed kettle for cooking and water should *not* be added (added water must be declared on the label). After cooking, the berries may be put into the press cloths and the entire kettleful pressed at once in a large hydraulic press. Commercially the juice may also be prepared by adding 0.1 per cent of pectinol ("M") to mashed,

The pressed juice is heated to simmering, placed in hot bottles or jars, sealed and processed in a boiling water bath for 10 minutes. Like canned blueberries the juice may be kept some time, but the quality and color are best the first year or two. When the bottle of juice is opened, a slice of lemon or a little lemon juice in each tumbler will improve the flavor. A small amount of sugar, some water and a few grains of salt, also, may be added.

Blueberries have not been used extensively for jelly in this country but they were so used in Scotland as early as 1789 (42). Blueberry jelly may be made from the juice by boiling to the proper consistency or by adding commercial pectin⁵ such as "Certo," "Sure-Jell," etc. Jelly which is made by boiling the juice down is of very poor quality because much of the flavor is lost. The texture is never as good as jelly made from juice to which pectin has been added. When properly prepared, blueberry jelly is an excellent product and should be on every preserve shelf.

Sturtevant (42), reporting a number of early writers, some as early as 1615, says the Indians used to gather blueberries and dry them in the sunshine. The dry berries called *Sautash* were powdered and mixed with parched meal to make a dish called *Sautathig* which the Indians enjoyed very much. Other types of blueberries were pressed in cakes before drying. Blueberries were dried at home in the sun or in the attic until about 25 years ago. Berries for drying⁶ should be firm but not overripe. If a home dehydrator has been built or purchased this will be used, otherwise any fine screen will do. Place the berries only one layer thick on the drying rack. This will be one quart or less per square foot of surface. During dehydration the temperature of the berries should not be over 160 deg. F. (13). If the oven is used as a source of heating for the dehydrator the burner should be turned on until the temperature is about 190 deg. F. and then turned off. In about 15

uncooked berries and letting them stand 4 to 10 hours in a wooden or aluminum tank. After standing, the berries should be pressed. The juice should be heated as soon as possible after pressing, and put into bottles and sealed above 190° F. Powdered lemon juice may be added to improve the flavor. The latter will add some sugar and solids.

⁵ An excellent commercial product may be made from blueberry juice with the addition of pectin, sugar, acid and powdered lemon juice. For the method and the results of the research work see Appendix D.

⁶ Methods of commercial dehydration will be found in Appendix E.

to 20 minutes the oven can be turned on again until the temperature is 190 deg. F. and then turned off. This procedure should be continued until the berries are dry and will require 8 or 10 hours. The oven door should be left open $1\frac{1}{4}$ to $1\frac{1}{2}$ inches all of the time as over a pint of water must be driven off of each quart of berries. When wood, coal or oil burning stoves are used, the drying rack may be hung from the ceiling directly over the stove. The berries should be weighed before and after drying. Every pound of fresh berries should weigh less than 3 ounces when the drying is completed. Blueberries which have not been completely dried will mold during storage.

If a dehydrator is not available and it is not convenient to use the oven, blueberries may be dried on screens or trays placed in the sun. However, this method requires several days to 2 weeks depending upon the weather. As there is often foggy weather during the blueberry season it may be necessary to use the oven or to place an electric hot plate near the berries with a fan to blow air across the hot plate onto the berries.

Store dehydrated blueberries in a closed air-tight container, preferably in a dry cool place.

Blueberries are dehydrated more easily than most fruits or vegetables and the methods given here may not give satisfactory results with other foods.

To rehydrate, the berries should be put in warm or hot water for about a half hour and then brought to a boil and boiled gently 15 to 20 minutes. Blueberries will not take up all of the water they have lost and therefore it would be well to use 13 ounces of water to 4 ounces of berries to get fruit equivalent to 1 quart of fresh fruit.

APPENDIX A
TABLE 1
Percentage Composition of Whole Blueberries on a Fresh Weight Basis and Blueberry Juice

Number	Species	Variety and year	Source of sample	Moisture	Carbohydrates				Fat	Protein NX 6.25	Acid as citric	Ash	Minerals						Basis of original report	Reported by ¹			
					Total sugars	Reducing	Acid Hydrolyzable	(Trude fiber					Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO	K ₂ O	P ₂ O ₅			MnO		
1 Unknown		Unknown		83.4	15.1		1.2	0.6	0.67	0.28					0.0013	0.0364	0.0165	0.0783	0.0258		Fresh	11	
2 Unknown		Unknown													.0006						portion	39	
3 Unknown		Unknown		81.3											.0020*	.0191			.0813		Fresh	23&35	
4 V. canadense		Wild '34	Columbia, Me.							.25													
5 V. corymbosum		Wild	Oneida Lake, N. Y.							.21†	0.0359†	.0217†	.0374†	.0237†	.0117†	.0297†	.0007				Dry fruit	17	
6 V. corymbosum		Katherine '34	N. Sedgwick, Me.							.30		.0020*	.0175			.0230					Fresh	•	
7 V. corymbosum		Adams '34	N. Sedgwick, Me.							.32		.0020*	.0189			.0211					Fresh	•	
8 V. corymbosum		Pioneer '34	N. Sedgwick, Me.							.30		.0020*	.0202			.0206					Fresh	•	
9 V. corymbosum		Pioneer	E. Wareham, Mass.	81.3†	16.2	§	1.0	.5	.6	.27											Moisture free	28	
10 V. corymbosum		Harding	E. Wareham, Mass.	81.3†	15.5	§	1.5	.7	.7	.26											Moisture free	28	
11 V. corymbosum		Cabot	E. Wareham, Mass.	81.3†	16.0	§	1.1	.6	.8	.23											Moisture free	28	
12 V. corymbosum		Concord	Whitesbog, N. J.	81.3†	16.0	§	1.0	.6	.8	.28											Moisture free	28	
13 V. corymbosum		Jersey	Whitesbog, N. J.	81.3†	15.8	§	1.5	.6	.6	.26											Moisture free	28	
14 V. corymbosum		Rubel	E. Wareham, Mass.	81.3†	15.7	§	1.4	.6	.8	.26					0.0036	.0193	.0174	.0162	.0598	.0002		Moisture free	28

TABLE 1—(Concluded)

Number	Species	Variety and year	Source of sample	Moisture	Carbohydrates				Fat	Protein NX 6.25	Ash	Minerals						Basis of original report	Reported by ⁷		
					Total sugars	Reducing	Acid Hydro- lyzable	Crude fiber				Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO	K ₂ O	P ₂ O ₅			MnO	
15	<i>V. corymbosum</i>	Wild	Goshen, Mass.	84.01	13.2	%		1.4	.51	.6	}	.22	.0045		.0891	.0271	.1389	.0495	.0014	Moisture free	28
16	<i>V. corymbosum</i>	Wild	Amherst, Mass.	84.01	12.2	%		2.3	.71	.7		.25								Moisture free	28
17	<i>V. pennsylvanicum</i> ^f	Wild	Heath, Mass.	84.01	13.6	%		1.0	.51	.6		.20								Moisture free	28
18	<i>V. pennsylvanicum</i>	Wild	Cherryfield, Me.	84.01	13.8	%		1.1	.31	.5	.23		.0032		.0405	.0232	.1195	.0437	.0045	Moisture free	28
19	<i>V. angustifolium</i> ^f	Wild '33	Columbia, Me.		10.1	9.0	0.8			.5										Fresh	10
20	<i>V. angustifolium</i>	Wild '36	Columbia, Me.		9.1	7.1	1.8			1.3										Fresh	•
21	<i>V. angustifolium</i>	Wild '33	Harrington, Me.		9.7	9.0	.7			.4										Fresh	•
22	<i>V. angustifolium</i>	Wild '36	Harrington, Me.		11.5	9.3	1.8			1.2										Fresh	•
23	<i>V. angustifolium</i>	Wild '34	Columbia, Me.								.29		.0020*		.0220			.0269		Fresh	•
24	<i>V. angustifolium</i>	Wild '34	Harrington, Me.								.32		.0020*		.0161			.0228		Fresh	•
25	<i>V. angustifolium</i>	Wild '34	Harrington, Me.								.25		.0020*		.0217			.0316		Fresh	•
26	Unknown	Wild '41	W. Rockport, Me.	85.9	12.4				.0	.1	.19	.19								Fresh Juice	11
27	<i>V. angustifolium</i> ^f	Wild '41	Cherryfield, Me.	91.2	10.1	9.9				.1	.32	.19								Juice	9
28	<i>V. angustifolium</i>	Wild '41	Me.	10.4	9.9					.1	.21									Juice	9
29	<i>V. virgatum</i>	Wild '41	Crestview, Fla.		9.1	8.7				.1	.22	.20								Juice	9

* Iron was determined on a composite sample.

† Harris and Thomas did not give the moisture content and 84.4 was used to change the figures.

‡ One moisture content was given for the cultivated varieties and one for the wild varieties.

§ Sugars reported as "Extract" matter.

|| Reported as "Ether Extract."

¶ *V. angustifolium* Ait. and *V. pennsylvanicum* Lam. are synonymous.

• Data from author's investigation which has not been previously reported. The data were obtained from analyses following the official methods (40).

APPENDIX A

TABLE 2

Content of Some of the Elements not Reported in Table 1

No.	Material reported	Amount reported	Basis of report	Reference ⁸
2	Chlorine	0.008 per cent	Fresh weight	39
2	Sulfur	.011 per cent	Fresh weight	39
5	Silicon dioxide	.0131 per cent	Fresh weight	17
30	Iodine	206 parts per billion	Dry weight	38
31	Copper	.011 per cent	Fresh weight	22

TABLE 3

Vitamin Content of 100 grams of Fresh Blueberries⁹

Source of fruit	Vitamin Content		Reference ¹⁰
	A	C	
	IU	Mg IU	
Unknown	20	100	29
Boston		100	15
New York	50		7
No. Carolina		6	4

TABLE 4

Milligrams of Vitamin C per hundred grams of Fresh Fruit in Different Varieties of High-bush Blueberries

Variety	Investigators		
	Kirk and Tressler (20) New York	Lineberry and Burkhart (25) No. Carolina	Lineberry and Burkhart (24) No. Carolina
Cabot	13	24.7	18.6
Concord	18		16.0
Jersey	12		
Pioneer	13	20.9	
Rancocas	15	17.1	18.4
Rubel	20		
Seammell			16.5
Stanley		19.0	
Weymouth		20.9	
3401-40		26.6	

⁸ Reference is to "Literature Cited," page 37.⁹ Blueberries also contain 45 micrograms of B₁ (5) and 15 micrograms of G (36) per 100 grams of fresh blueberries.¹⁰ Reference is made to "Literature Cited," page 37.

APPENDIX B

STORAGE OF BLUEBERRIES

A special storage unit was constructed in 1941 to study the storage of blueberries under controlled atmosphere and controlled temperature. In the first study the berries were cleaned before they were stored. The storage period lasted for 2 weeks (Aug. 13 to 27, 1941), half of the berries were kept at 50° F. and half at 41° F. Ninety-six quarts of berries were sealed in each of four containers. In one container at each temperature the carbon dioxide was allowed to accumulate (maximum 17.6%) while in the other it was allowed to accumulate to ten per cent and then was maintained at this level. At the end of the storage period all berries were in good condition and were marketed after covering with new "Cellophane." The second study was very similar to the first, using the same temperature but lasting for 3 weeks (Aug. 27 to Sept. 16, 1941). The carbon dioxide content was kept between 12 and 15 per cent. In this study only half of the berries were covered with "Cellophane." The second study showed that the berries in quart boxes stored without "Cellophane" kept better than berries in quart boxes covered with "Cellophane"; fully ripe berries do not store as well as berries harvested just before they are fully ripe; some selections of low-bush stored much better than others and some varieties of high-bush stored better than others; in general high-bush stores a little better than low-bush.

The third storage study (1942) was to determine the effect of cleaning berries before storage in contrast to those stored as they were raked and to study the effect of storage with very high nitrogen and low oxygen, and lower carbon dioxide than was used in the first two experiments. This study showed that blueberries store better without cleaning. Probably the reason for this is that winnowing bruises the fruit. While this damage is not immediately evident, it does cause the berries to become soft or shrink, or both. The berries stored with an increased content of nitrogen had much more mold than any of the other berries. Therefore, nitrogen should not be used in controlled storage. There was some mold on the berries stored in containers where the CO₂ content was kept below 8 per cent.

The walls, floor, and ceiling of rooms for controlled atmosphere storage must be specially treated to prevent the passage of gases through them. This is accomplished with two or three coats of specially prepared paint or by covering the walls, ceiling, and floor with metal and soldering all joints. All openings, doors, ventilators, etc., must be sealed. During the storage period the air in the storage chamber should be sampled and analyzed frequently. The analytical work is not difficult and the equipment is not expensive.

The method of storing blueberries and the keeping quality are very similar to those of strawberries and cherries (44).

APPENDIX C

FRUIT PRESS

The fruit press is designed for home construction and for the extraction of blueberry and other fruit juices. (See Fig. 1.) All material for the frame should be of pine, spruce or similar material. The slats in the rack and tray should be hardwood to resist the penetration of the fruit juices. The following is a list of the material necessary for construction:

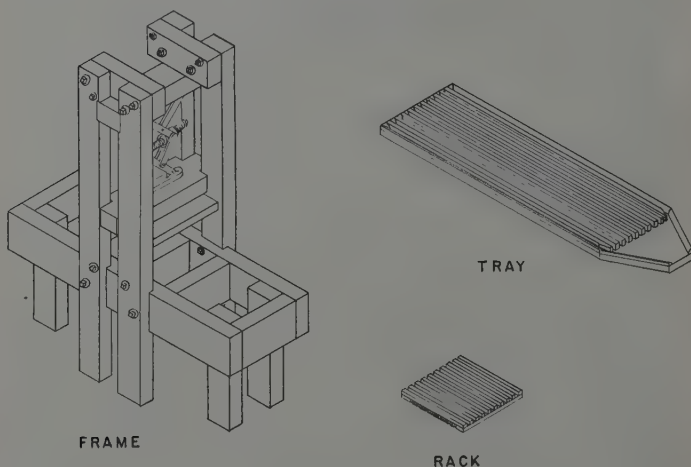


FIG. 1. Fruit Press.

For frame:

4-2" x 4" x 3'6"	Uprights
2-2" x 4" x 1'2¼"	Front Legs
2-2" x 4" x 1'2¾"	Back Legs
2-2" x 6" x 3'0"	Long Horizontals
5-2" x 6" x 8"	Cross Bracing
2-2" x 4" x 10"	Top Braces
1-2" x 4" x 15¼"	Top Jack Carrier
1-2" x 6" x 15"	Bottom Jack Carrier and guide
1-1" Board 10"	
Square	Bottom Press Board
16-¾ Bolts and nuts with washers	
1-Scissors or similar jack	

For tray:

1-1" Board 1'0" x 3' x 6"	Base Board
9 Feet - $\frac{1}{2}$ " Quarter Round	Edging
10 Strips - $\frac{1}{2}$ " x 1" x 3'0"	Slats

For rack: (2 or 3 advisable)

2- $1\frac{1}{4}$ " x $\frac{9}{16}$ " x $9\frac{7}{8}$ "	End pieces
26- $\frac{5}{16}$ " x $\frac{9}{16}$ " x $9\frac{7}{8}$ "	Slats

For fruit bags: (2 or 3 advisable)

A piece of jute or washed burlap greater than $19\frac{3}{4}$ " and less than 29" square.

To construct the frame, two pieces (2" x 6" x 3'0") called long horizontals, should be fitted with the five cross braces, as shown in the plan. Then the legs, two of which are shorter than the other two in order to give a slope necessary for the flow of the juice, should be attached as shown and the whole securely spiked together. The two center uprights should then be cut to receive the horizontal members and the top jack carrier. The gain or slot at the bottom should be about $\frac{3}{4}$ " deep and the one at the top about $\frac{3}{8}$ ". The uprights should then be bolted in place.

The scissors or similar jack, securely bolted to the top and bottom carrier members, should then be attached to the top braces and the whole securely bolted in place. The bottom carrier member should be cut at the ends so as to slide freely between the uprights and to act as a guide. The 1" board should be nailed to this bottom carrier in order that a smooth surface may be presented to the material being pressed.

The rack should be constructed as shown in the drawing and all nails should be set and filled (plastic wood) so that as little metal as possible will come in contact with the juice. One of these racks should be placed between each of the filled press cloths.

The tray is constructed as shown with the small end cut to a width of about $3\frac{3}{4}$ " and tapered back about 7" on each side to its full width of $11\frac{3}{8}$ ". The strips are placed on edge and about $1\frac{1}{8}$ " on center and should be planed to a slope of $\frac{1}{2}$ " in three feet to present a level surface to the material being pressed. These strips should be of hardwood and all nailing done from the bottom side to

present as little metal as possible to the juice as in the case of the racks.

The material being pressed should be placed in the middle of the press cloth (jute or washed burlap sheets), spread about $\frac{1}{2}$ " thick, and then fold the cloth to a square shape the size of the racks. For continuous operation several of these sheets should be available.

APPENDIX D

BLUEBERRY JELLY

In the last few years many batches of jelly have been made in an effort to determine the best commercial formula and method of preparing the juice for blueberry jelly. The results of these studies show that the berries must be of good quality. The use of too many green berries results in a granular jelly of poor flavor. The use of overripe berries, also, produces a jelly of poor flavor. In the fresh fruit section the small berries from grading machines, if of good quality, may be mixed with an equal volume of good berries and an excellent product will be obtained. The juice should be prepared as previously described under the section on juice. The following formula was the most satisfactory of those tried.

1. Put 100 pounds or 11.5 gallons of juice in a jacketed kettle and turn on steam.
2. Mix one pound of pectin (100 grade) and $1\frac{1}{2}$ pounds of powdered lemon juice with 10 pounds of sugar.
3. a. If the juice was obtained by cooking the berries, when the juice reaches a temperature of about 170° F. add the mixture of pectin and sugar and bring to a brisk boil stirring frequently.
b. If the juice was obtained by treating with pectinol, it should be brought to 190° F. and held for 10 minutes to destroy the pectinol, add the pectin and sugar and bring to a brisk boil stirring frequently.
4. Add 90 pounds of sugar and boil to 220° F.
5. Add a pint of citric acid solution made by dissolving 1 pound of citric acid crystals in 1 pint of water.
6. Fill containers at once and cap above 190° F.

This jelly will have good texture and a very pleasing blueberry flavor. If it has been prepared from cooked berries it will have a very dark color and will be opaque. If it is prepared from berries treated with pectinol it will be a bright red and translucent.

APPENDIX E

DEHYDRATION OF BLUEBERRIES

The development of equipment and methods for the drying of blueberries commercially was studied in Denmark in 1912 (21). The commercial dehydration of blueberries was started in Canada in 1942. So far only experimental work has been done in the United States.

Small lots of blueberries have been dried in various ways at the University of Maine since 1928. Although these studies have not given information on the best method of commercially dehydrating blueberries they have given considerable information. Blueberries, without pretreatment to remove the bloom, were satisfactorily dehydrated in a tunnel drier in 10 to 16 hours at 145° F. with an air flow of 500 linear feet per minute. The berries should be spread evenly about one pound per square foot of tray surface. Eidt (13) recommended a lye dip ($\frac{1}{4}$ to $\frac{1}{2}$ per cent at 150 to 200° F. for a few seconds) to remove the bloom, and a beginning temperature of 140° F. in a counter-current drier and a finishing temperature of 160° F. with an air flow of 1000 feet per minute. With the bloom removed from the fruit Eidt (13) found that the drying time could be cut in half. Friar and Mrak (16) recommend 1 to 1½ pounds per square foot for tray loads of *V. ovatum*, one of the California blueberries. They obtained their best drying at 140° F. for 23 hours without pretreatment.

One lot of berries was dehydrated in a Mojonnier Brothers Company vacuum dehydrator through the courtesy of Thron Thompson. This indicated that blueberries could be dehydrated in about 2 hours with 24 inches of vacuum, 230° F. and 1½ pounds of berries per square foot of tray.

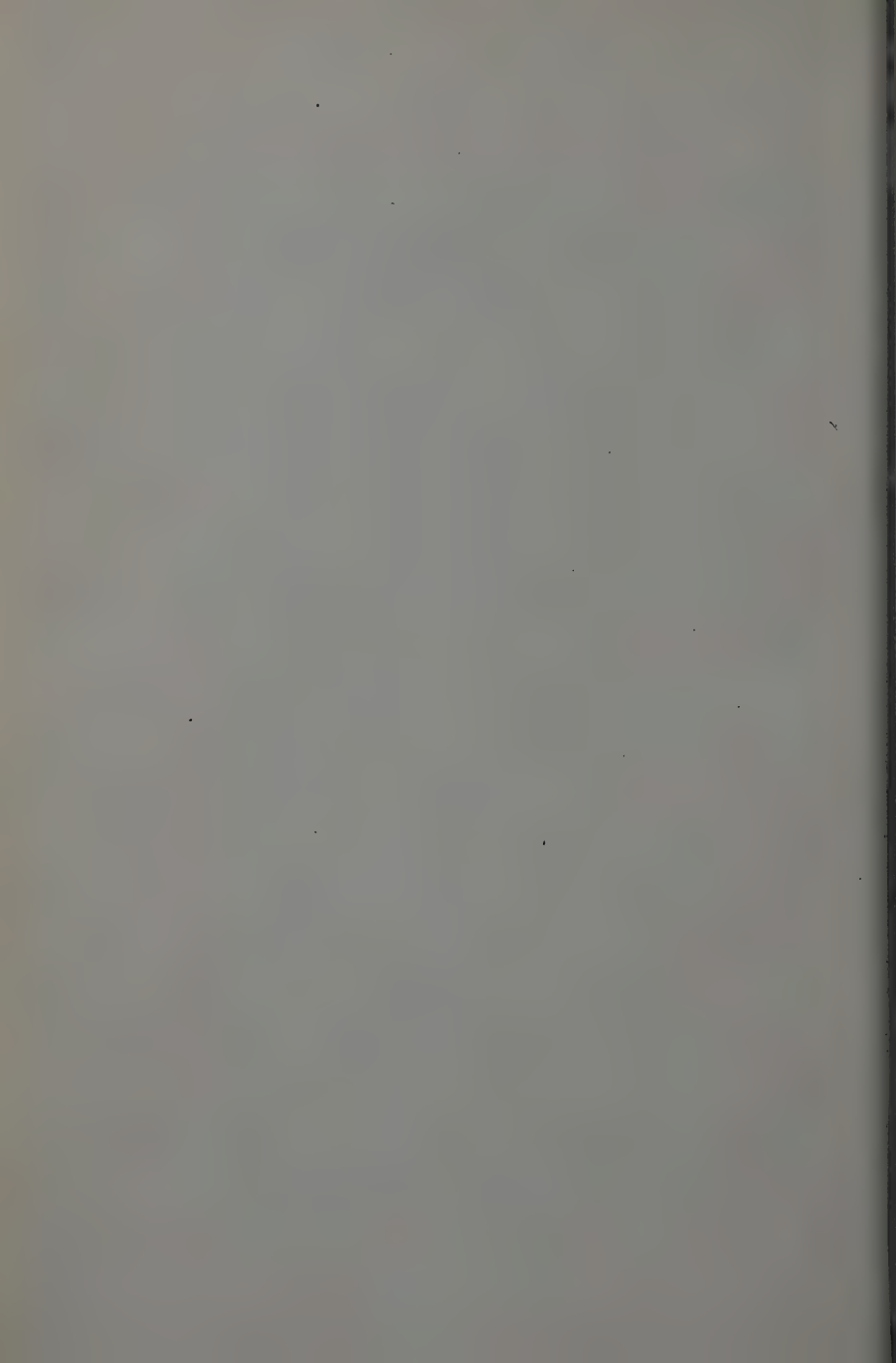
From these studies it is evident that blueberries can be dehydrated with less trouble than is encountered with many fruits and vegetables.

LITERATURE CITED

1. Allen, Frederick M. Blueberry Leaf Extract. Jour. Amer. Med. Assn. 89: 1577-1580. 1927.
2. Andrews, M. N. Blueberries for Ornament. Gard. Chron. Am. 41: 83-4. 1937.
3. Arauner, P. The Preparation of Blueberries and Other Fruits for Wine. Naturw. Wehnschr. 27 No. 19: 301-2.
4. Bessey, Otto A. A Method for the Determination of Small Quantities of Ascorbic Acid and Dehydroascorbic Acid in Turbid and Colored Solutions in the Presence of Other Reducing Substances. Jour. Biol. Chem. 126: 771-784. 1938.
5. Bessey, Otto A. Vitamin C—Methods of Assay and Dietary Sources. Jour. Amer. Med. Assn. 111: 1290-1298. 1938.
6. Booher, Lela E. and Hartzler, Eva R. The Vitamin B₁ Content of Foods in Terms of Crystalline Thiamin. U.S.D.A. Tech. Bul. 707. 1939.
7. Booher, Lela and Marsh, Rosemary Loughlin. The Vitamin A Values of 128 Foods as Determined by the Rat-Growth Method. U.S.D.A. Tech. Bul. 802. 1941.
8. Chandler, F. B. Blueberry Storage. Sci. 95: 603-604. 1942.
9. Chandler, F. B. and Highlands, M. E. Blueberry Juice.
10. Chandler, F. B. and Mason, I. C. Effects of Fertilizer on the Native Maine Blueberry. Am. Soc. Hort. Sci. 30: 297-298. 1933.
11. Chatfield, Charlotte and McLaughlin, Laura L. Proximate Composition of Fresh Fruit. U.S.D.A. Cir. 50 revised 1931.
12. Diehl, H. C., Pentzer, W. T., Berry, J. A. and Asbury, C. E. Suggestions for Freezing Foods are Outlined. Western Canner and Packer 26 No. 5-8. 1934.
13. Eidt, C. C. Talk on Dehydrated Blueberries, Delivered in Bangor, Maine, in March, 1943.
14. Fellers, C. R. and Isham, P. D. Vitamins C and A in Blueberries. J. A. R. 47: 163-165. 1933.
15. Fitzgerald, G. A. and Fellers, C. R. Carotene and Ascorbic Acid Content of Fresh Market and Commercially Frozen Fruits and Vegetables. Food Res. 3: 109-120. 1938.
16. Friar, Hazel and Mrak, E. M. Dehydration of Huckleberries. The Fruit Products Journal 22: 138-139. 1943.
17. Harris, C. H. and Thomas, W. D. The Fruit of *Vaccinium corymbosum*. Chem. News 114: No. 2960: 72. 1916.
18. Heise, R. On the Coloring Matter of Huckleberries. Arb. Kais. Gesund. 9: 478. 1894. Abs. in Chem. Ztschr. 18: No. 102. 1894.
19. Hodges, M. A. and Peterson, W. H. Manganese, Copper and Iron Content of Serving Portions of Common Foods. Jour. Am. Dietetic Assoc. 7, 6. 1931.

20. Kirk, M. M. and Tressler, Donald K. Ascorbic Acid Content of Pigmented Fruits, Vegetables, and Their Juices. *Food Research* 6: 395-411. 1941.
21. Lind, G. Experiments in Desiccation of Wild Berries. *K. Landthr. Akad. Handl. och Tidskr.* 52. No. 3: 172-191. 1913.
22. Lindow, C. W., Elvehjem, C. A. and Peterson, W. H. The Copper Content of Plant and Animal Foods. *Jour. Biol. Chem.* 82: 465-471. 1929.
23. Lindow, C. W. and Peterson, W. H. The Manganese Content of Plant and Animal Materials. *Jour. Biol. Chem.* 75: 169-175. 1927.
24. Lineberry, R. A. and Burkhart, Leland. The Vitamin C Content of Small Fruits. *A.S.H.S.* 41: 198-200. 1942.
25. Lineberry, R. A. and Burkhart, Leland. The Stability of Vitamin C in Small Fruits. *Fruit Prod. Jour. and Amer. Vinegar Indust.* 22: 164-165, 177. 1942-1943.
26. Lovell, J. H. and Lovell, H. B. Low-bush Blueberry as a Honey Plant. *Am. Bee Jour.* 77: 482-3. 1937.
27. Marie-Victorien, FR des E. C. Notes Collected in the Region of the Temiscaming. *Naturaliste Canadien* 45: 163-169.
28. Merriam, O. A. and Fellers, C. R. Composition and Nutritive Studies on Blueberries. *Food Res.* 1, No. 6: 501-512. 1936. Abs. in *Mass. Sta. Bul.* 339, p. 98. 1937.
29. Merriam, O. A. and Fellers, C. R. Vitamin Content and Other Nutrition Studies with Blueberries. *Mass. Sta. Bul.* 339. 1937.
30. Merriam, O. A., Fellers, C. R., and Isham, P. D. Nutritional Studies on Blueberries. *Mass. Sta. Bul.* 327. 1936.
31. Munson, W. M. The Horticultural Status of the Genus *Vaccinium*. *Maine Agr. Exp. Sta. Bul.* No. 76. 1901.
32. Moon, H. H., Smart, H. F., and Caldwell, J. S. Varietal Suitability of Cultivated High-bush Blueberries for Freezing in Consumer Packages. *Fruit Products Jour.* 15: 229, 248, 251. 1936.
33. Nelson, E. K. The Non-Volatile Acids of the Pear, Quince, Apple, Loganberry, Blueberry, etc. *Jour. Amer. Chem. Soc.* 49: 1300-1302. 1927.
34. Ostermayer, E. Blueberry Wine a Natural Iron-Manganese Preparation. *Pharm. Ztschr.* 47: 316. 1902.
35. Peterson, W. H. and Elvehjem, C. A. The Iron Content of Plant and Animal Foods. *Jour. Biol. Chem.* 78: 215-223. 1928.
36. Phahl, W. Blueberry Juice and Its Reactions. *Ztschr. Untersuch. Nahr. und Genussmitt.* 13: 1-5. 1907.
37. Queal, L. M. Ways to Use Blueberries. *Mass. Agr. Ext. Leaflet* 39. 1919.
38. Remington, R. E. Unanswered Questions in the Biochemistry Geochemistry of Iodine. *Jour. Chem. Educ.* 7. 2590. 1930.
39. Sherman, H. C. Chemistry of Foods and Nutrition. Macmillan Co. N. Y. 1941.

40. Skinner, W. W. (Chairman of Editorial Board). Official and Tentative Methods of Analysis of the Association of Official Agricultural Chemists. Washington, D. C. 4th Ed. 1936, 5th Ed. 1940.
41. Smart, Helen F. Microbiological Studies on Cultivated Blueberries in Frozen Pack. Food Research 2: 429-434. 1937 and 4: 287-292. 1939.
42. Sturtevant, E. L. Notes on Edible Plants. Rept. of the New York Expt. Sta. 1919.
43. Tressler, D. K., Joslyn, M. A. and Marsh, G. L. Fruit and Vegetable Juices. The Avi Pub. Co., N. Y. pp. 274-283. 1939.
44. Van Doren, A., Hoffman, M. B. and Smock, R. M. Carbon Dioxide Treatment of Strawberries and Cherries in Transit and Storage. A. S. H. S. 38: 231-238. 1941.
45. Watson, E. M. Blueberry Leaf Extract in Diabetes. Canadian Medical Assn. Jour., Montreal. 19: 166. 1928.
46. Watson, G. N. The Juice of the Blueberry as an Indicator. Am. Jour. Pharm. 85: 246. 1913.
47. Williamson, D. D. Uses of Blueberries. N. H. Agr. Ext. Press Bul. 176. 1936.



USE OF MACHINERY AND HORSES ON MAINE FARMS KEEPING DAIRY COWS

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PURPOSE AND SCOPE OF STUDY

This study shows the extent to which Maine dairy farms are mechanized, with a comparison for herds of different size. The information indicates the opportunities for further developments in the use of machinery in order to obtain a more efficient utilization of the available labor supply.

Estimates of the amount of new machinery needed were obtained as a guide to government agencies in setting up adequate quotas necessary for maintaining or increasing production in Maine. Information concerning the age and use of equipment also indicates the degree of obsolescence and the extent to which replacements will be necessary.

The use and costs of operating autos, trucks, tractors, and horses are presented. The relative efficiency of different methods of getting in hay, use of milking machines, methods of watering cows, and availability of electricity also are discussed.

Much of the information used in this study, including the availability of equipment, its use, age, and replacement needs, was obtained during the summer of 1943 from 500 Maine farmers keeping dairy cows.¹ These farmers were located in five areas of the general dairy farming area of Maine, and included all farmers in the selected areas that sold any appreciable volume of dairy products.² Other information, including the operation of autos,

¹ Other phases of this study included information on farm labor, utilization of milk, dairy cow replacements, and problems of getting grain.

Mr. A. L. Perry and Mr. J. R. Smyth, Jr. assisted in the survey work; Miss Margaret Smith assisted in the tabulation of the data; and Dr. Charles H. Merchant offered many helpful suggestions.

² The towns, all or part of which were included in the survey, were Unity, Thorndike, Knox, Freedom, and Montville in Waldo County; Farmington, Industry, New Vineyard, Strong, Temple, Avon, Freeman, and Phillips in Franklin County; Windham, Gorham, Standish, Raymond, and Gray in Cumberland County; Monmouth, Litchfield, Manchester, Winthrop, Wayne, and Readfield in Kennebec County; and Newport, Corinna, Exeter, and Stetson in Penobscot County.

trucks, tractors, horses, milking machines, and methods of watering cows, was obtained from several earlier dairy farm management studies. Some data also were taken from reports of the 1940 Census, including the trends in the farm use of motive power.

Although the towns included in the surveys had both large and small herds, the herds averaged somewhat larger than the average for the entire State. In the 1943 survey, only 17 per cent of the herds had one to four cows, as compared with 69 per cent for all dairy farms in Maine, or 53 per cent of all herds from which there was any sale of dairy products.³

PROPORTION OF FARMS HAVING VARIOUS KINDS OF EQUIPMENT

Approximately 91 per cent of the farmers included in the 1943 survey owned and used plows, cultivators, harrows, mowing machines, dump rakes, and hayforks. Farm trucks were operated by 54 per cent, and autos by 55 per cent, with either autos or trucks operated by 83 per cent of all farmers. Factory-made tractors were used by about one-third of the farmers, with homemade tractors used by an additional 16 per cent, making a tractor of one kind or another available on approximately one-half of all farms. Manure spreaders were used by about one-half of the dairymen; milking machines and ensilage cutters by about one-third; and potato equipment by about one-quarter of the dairymen. Hay loaders, side delivery rakes, and threshing machines were owned and used by only one out of every six or eight farmers.

The farms in the Franklin and Kennebec County areas in 1943 were not as fully mechanized as those in Waldo, Penobscot, and Cumberland County areas. A detailed comparison by areas is available in table 19 of the appendix.

The farms with the larger herds, as would be expected, were mechanized to a much greater extent than those with the smaller herds (table 1). On the farms with few cows, there was little need for milking machines, manure spreaders, side delivery rakes, and hay loaders. Many farmers with only a few cows worked off the farm and had a relatively small acreage of cultivated crops. Con-

³ Agriculture, Cows Milked and Dairy Products, 1940 Census, p. 259. Bur. of Census, U. S. Dept. Commerce.

TABLE 1

*Proportion of Farmers Having Selected Kinds of Equipment by Size of Herd, for 500 Farms Keeping Dairy Cows in 1943**

Kind of equipment	Per cent of all farmers						
	1-2 cows	3-4 cows	5-9 cows	10-14 cows	15-19 cows	20 or more cows	All herds
Auto	43	51	51	60	53	64	55
Truck	27	40	43	58	71	87	54
Auto or truck	50	76	79	89	90	97	83
Factory tractor	10	20	22	39	49	69	34
Homemade tractor	17	24	17	17	16	3	16
All tractors	27	44	39	54	63	72	49
Manure spreader	7	22	38	68	71	87	51
Hay loader	3	4	10	17	16	48	16
Side delivery rake	—	4	6	14	12	46	13
Dump rake	80	82	93	90	96	95	91
Mowing machine	79	82	93	89	93	100	91
Milking machine	—	—	14	55	58	84	35
Plow	79	86	92	94	87	93	91
Cultivator	79	86	93	91	91	95	91
Harrow	79	88	93	92	84	93	90
Ensilage cutter	—	6	17	48	71	75	35
Sprayer or duster	11	12	23	17	22	34	21
Potato digger	11	12	23	25	27	32	23
Thresher	7	12	12	10	13	23	13
Hayfork	80	85	95	97	100	98	94
Number of herds	30	55	178	127	49	61	500

* Several farmers also owned equipment that was not used, most of which was old and obsolete, including one 1934 truck, three ensilage cutters, seven hay loaders of which five averaged 18 years old, three old manure spreaders, two old side delivery rakes, and one homemade tractor.

sequently, they had less need for tillage equipment and specialized machinery such as potato diggers and ensilage cutters. On the smaller farms, there also was more of a tendency to hire equipment work done or to exchange work with a neighbor who owned labor saving equipment.

Milking machines were used in 1943 by none of the farmers with less than five cows, but by 55 per cent of those with ten to fourteen cows, and by 84 per cent of those with twenty or more cows (table 1). Manure spreaders were owned by only 7 per cent of those with one or two cows, but by 87 per cent with twenty or more cows. Side delivery rakes and hay loaders were owned by only three of the farmers with less than five cows, but by about 47 per cent of those with twenty or more cows.

Nearly every farmer owned a dump rake, mowing machine, plow, cultivator, and harrow. Nevertheless, on the farms with the smallest herds, about 80 per cent of the farmers owned these items

of equipment as compared with about 95 per cent for those with the largest herds.

Autos or trucks were owned in 1943 by one-half of the farmers having one or two cows, by 89 per cent with 10 to 14 cows, and by 97 per cent with twenty or more cows. Trucks were available on only 27 per cent of the smaller farms as compared with 87 per cent of the larger farms. Tractors were operated by slightly over one-fourth of the farmers with the smallest herds as compared with nearly three-fourths of those with the largest herds. Homemade tractors, which were made from old autos, were most prevalent on the smaller farms, whereas on the larger farms nearly all tractors were factory made.

AGE OF SELECTED KINDS OF EQUIPMENT

Autos, trucks, and factory-made tractors on dairy farms in 1943 had been used an average of about seven years. Homemade tractors and dump rakes were much older, having been used an average of about 14 years. Manure spreaders, hay loaders, and side delivery rakes were an average of 9.4 to 11.5 years old.

The variation in age of each of these items of equipment in 1943 is shown in table 2. Equipment that was under seven years of age (manufactured since 1936) included about one-half of the autos and trucks, 59 per cent of the factory-made tractors, 43 per cent of the hay loaders, 39 per cent of the side delivery rakes, 36

TABLE 2

Variation in the Age of Selected Kinds of Equipment Owned by 500 Farmers Keeping Dairy Cows in 1943

Kind of equipment	Per cent of total number of each kind, with age of							Average age in years
	1-3 years	4-6 years	7-9 years	10-12 years	13-15 years	16-18 years	19 or more years	
Auto	22	25	27	11	13	2	—	7.1
Truck	19	32	27	11	9	1	1	6.9
Factory tractor	31	28	15	7	7	4	8	7.5
Homemade tractor	—	—	1	13	75	4	7	14.1
Manure spreader	23	13	6	15	15	8	20	11.5
Hay loader	27	16	4	13	16	6	18	10.4
Side delivery rake	22	17	11	17	21	1	11	9.4
Dump rake	14	13	7	10	18	6	32	14.4

per cent of the manure spreaders, and 27 per cent of the dump rakes. Equipment that was over 15 years of age (manufactured prior to 1928), included 38 per cent of the dump rakes, 28 per cent of the manure spreaders, 24 per cent of the hay loaders, 12 per cent of the side delivery rakes and tractors, and 2 per cent of the autos and trucks.

The expected length of life for any piece of equipment depends to some extent on the amount of use. On the larger farms, equipment received more usage and thus depreciated more rapidly. Consequently, there was a slightly lower average age of equipment on the farms with the larger herds, as shown in table 20. The total years of use, as indicated by the average age of equipment that needed replacement, was 11 years for trucks, 13 for factory tractors, 16 for side delivery rakes, 19 for manure spreaders, and 22 for hay loaders and dump rakes. Dump rakes were good for an average of 26 years on farms with one to four cows, 23 years on farms with five to nine cows, 21 years on farms with ten to fourteen cows, and 17 years on farms with fifteen or more cows.

NEW EQUIPMENT NEEDS

The dairymen interviewed during the summer of 1943 indicated that their replacement needs by the end of 1944 amounted to 11 or 12 per cent for mowing machines and harrows, 9 per cent for manure spreaders, side delivery rakes, and dump rakes, 8 per cent for plows, 6 per cent for cultivators and ensilage cutters, 5 per cent for milking machines and hay loaders, about 3 per cent for trucks and tractors, and none for autos.⁴

The average replacement requirements per 100 farms with different sizes of herds are shown in table 3. About one out of every ten of the dairymen with herds of 15 or more cows needed a new manure spreader and harrow for replacement purposes. Eight per cent of the larger dairymen also needed replacements for plows, seven per cent needed new dump rakes, and about three to four per

⁴ Dairymen were asked for a conservative estimate of the minimum amount of equipment needed, which they hoped to be able to purchase. The proportion needing replacement in any given year does not furnish an accurate basis for estimating the expected length of life of machinery, because the amount purchased annually has varied considerably.

cent needed replacements of the other more important items of farm machinery. The smaller farmers, as well as the larger ones, required a relatively large number of replacements for dump rakes, mowing machines, and harrows. For most other kinds of equipment, however, the smaller farms needed relatively few replacements because the farms were not as fully mechanized and equipment tended to last somewhat longer.

TABLE 3

Estimated Number of Selected Kinds of Equipment Needed Per 100 Farms for Replacement Purposes, During the Last Half of 1943 and in 1944

Kind of equipment	Number of replacements per 100 farms, in herds of				
	1-4 cows	5-9 cows	10-14 cows	15 or more cows	All herds
Truck	—	1.7	1.6	3.6	1.8
Tractor	—	—	.8	4.5	1.2
Manure spreader	—	2.8	6.3	10.0	4.8
Hay loader	—	—	—	3.7	.8
Side delivery rake	—	—	1.6	3.6	1.2
Dump rake	8.2	9.5	7.1	7.3	8.2
Ensilage cutter	—	1.1	2.4	4.6	2.0
Mowing machine	10.6	14.6	8.7	3.6	10.0
Milking machine	—	.6	3.2	4.5	2.0
Plow	4.7	7.3	6.3	8.2	6.8
Cultivator	3.5	6.8	5.5	3.6	5.2
Harrow	12.9	11.8	7.9	10.0	10.6

On a number of the larger farms there was an expressed need for additional new equipment, other than for replacement purposes, in order to utilize labor more efficiently and to increase production. New milking machines were desired by one-third of the dairymen who were hand milking 15 or more cows in 1943, by one-fourth of those with 10-14 cows, and by six per cent of those hand milking 5-9 cows (table 4). Side delivery rakes and hay loaders were desired on about one-fourth of the larger farms where hay was pitched on by hand. New manure spreaders and tractors also were in considerable demand on a number of the larger farms where such equipment had not previously been available. These figures indicate a tendency for the farmers with the larger herds to become more fully mechanized as rapidly as the machinery can be made available. Further evidence of the trend toward more mechanization is indicated by the fact that 91 per cent of the hay loaders, 89 per cent of the side delivery rakes, 76 per cent of the milking



FIG. 1. Many Additional Farmers Desire to Utilize Labor Saving Equipment Such As Side Delivery Rakes, Hay Loaders, Manure Spreaders, and Milking Machines.

machines, 71 per cent of the tractors, 54 per cent of the manure spreaders, and much of the potato equipment requested was for new types of equipment needed other than for replacement requirements.

The combined equipment needs for replacement purposes and for additional new equipment, by size of herds, is indicated in table 5. Of the new mowing machines requested, 38 per cent were trac-

TABLE 4

Proportion of Those Farmers Not Having Each Kind of Equipment that Desired New Equipment During the Last Half of 1943 and in 1944 by Size of Herd

Kind of equipment	Per cent of farmers				
	1-4 cows	5-9 cows	10-14 cows	15 or more cows	All herds
Truck	—	3	4	5	3
Factory tractor	—	4	6	14	5
Manure spreader	4	14	12	18	11
Hay loader	—	7	15	20	10
Side delivery rake	—	7	17	25	11
Milking machine	—	6	24	32	10
Ensilage cutter	—	4	10	11	5
Sprayer or duster	—	2	2	3	2
Potato digger	3	—	—	4	1
Thresher	—	—	1	1	1

tor mowers, 60 per cent were two-horse mowers, and 2 per cent were one-horse machines. Of the different types of new plows needed, 42 per cent were for tractor use, 43 per cent were two-horse sulky or riding plows, and 15 per cent were two-horse walking or side hill plows. The cultivator requirements were 59 per cent for tractors, 25 per cent for two horses, and 16 per cent for one

TABLE 5

*Estimated Number of Selected Kinds of New Equipment Needed Per 100 Farms for Replacement and for Additional New Needs During the Last Half of 1943 and in 1944, by Size of Herd**

Kind of equipment	Number of equipment needed per 100 farms, in herds of						Per cent for replacement
	1-2 cows	3-4 cows	5-9 cows	10-14 cows	15 or more cows	All herds	
Truck	—	—	3.4	3.2	4.5	3.0	90
Tractor	—	—	2.8	4.7	10.0	4.4	29
Manure spreader	—	5.5	11.8	10.2	13.6	10.4	46
Hay loader	—	—	6.2	12.6	17.3	9.2	9
Side delivery rake	—	—	6.7	16.5	20.9	11.2	11
Dump rake	6.7	14.5	11.2	10.2	7.3	10.2	80
Ensilage cutter	—	—	4.5	7.9	7.8	5.2	38
Mowing machine	3.3	16.4	15.7	15.8	4.5	12.6	79
Milking machine	—	—	5.6	14.2	12.7	8.4	24
Plow	3.3	7.3	10.1	8.7	11.8	9.4	72
Cultivator	—	9.1	9.6	10.2	8.2	8.8	59
Harrow	3.3	18.2	17.4	11.8	18.2	15.4	69
Sprayer or duster	—	—	2.2	3.9	1.8	2.2	36
Potato digger	3.3	1.8	.6	—	8.6	1.4	29
Grain thresher	—	—	—	.8	.9	.4	—
Bean thresher	—	—	.6	—	—	.2	—
Potato hoe	—	—	—	—	.9	.2	—
Corn planter	—	1.8	1.7	4.7	4.5	3.0	33
Reaper or binder	—	—	—	—	.9	.2	—
Potato planter	—	1.8	.6	1.6	1.8	1.2	33
Brooder stove	3.3	—	—	—	.9	.4	50
Hayfork carrier	3.3	1.8	—	.8	2.7	1.2	—
Bean puller	—	—	—	.8	—	.2	—
Corn harvester	—	—	—	—	1.8	.4	—
Lime sower	—	—	.6	—	.9	.4	—
Electric milk cooler	—	1.8	2.8	.8	2.7	2.0	—
Hay tedder	—	1.8	—	.8	.9	.6	—
Grain drill	—	—	—	.8	.9	.4	—
Green crop loader	—	—	—	.8	—	.2	—
Hayfork rope, 100 feet	18.0	17.8	37.8	38.4	58.0	39.0	—
Fence wire, 80 rod rolls	77.0	98.0	165.0	163.0	240.0	168.0	—
Number of farms	30	55	178	127	110	500	—

* Some farmers who did not wish to buy new equipment desired to purchase secondhand equipment, including among 500 farmers, a total of 10 trucks, 5 tractors, 5 mowing machines, 3 autos, 2 plows, 2 cultivators, 2 manure spreaders, 2 hay loaders, 2 side delivery rakes, 1 dump rake, and 1 ensilage cutter. Machinery repairs were indicated as needed on some farms, such as for mowing machine knives and guards, milking machine parts, plow points, cultivator teeth, manure spreader parts, dump rake wheels, and ensilage cutter repairs. These dairymen also reported needing a number of new tires. It was difficult, however, to ascertain the number of new tires needed in view of the uncertainty as to whether recaps and retreads would be satisfactory.

horse. Requests for new harrows included 23 per cent for tractor discs, 25 per cent for tractor springtooths, 30 per cent for two-horse discs, 21 per cent for two-horse springtooths, and 1 per cent for leveling harrows.

The dairymen included in the 1943 survey in the Cumberland and Penobscot County areas estimated slightly greater needs for new equipment than those in Waldo, Franklin, and Kennebec Counties. Both the Cumberland and Penobscot County areas were relatively intensive farming areas which probably were somewhat more adapted to mechanization. In Cumberland County, labor saving equipment was of extra importance because labor was especially scarce and higher wage rates were necessary due to the nearness of the Portland shipyards. In the Penobscot County area there was a relatively large acreage of potatoes and other cultivated crops which created extra demand for equipment. A detailed comparison by areas is given in the Appendix, tables 21 and 22.

The amount of new machinery needed during the last half of 1943 and in 1944 for all farmers in Maine outside of Aroostook County, that kept three or more dairy cows, is estimated in table 6. Estimates also are presented as to the approximate amount of machinery allocated to Maine farmers outside of Aroostook County during the two years 1943 and 1944. The figures for the amount needed and the amount allocated are not exactly comparable, but give a general indication of those items of equipment for which demand considerably exceeded the supply. Needs were estimated on the basis of requirements for only one and one-half years, whereas allocations were for the entire two-year period. Also, it is probable that some of the farms with only one or two cows had other important farm enterprises that required new machinery. It is also recognized that some of the allocations for 1944 were rather indefinite estimates, as indicated in the footnotes below table 6, and in all cases were subject to change during the year. Nevertheless, the data indicate that allocations, outside of Aroostook County, should have been fairly satisfactory in meeting the demand for new tractors, milking machines, and tractor plows; but have been far short of meeting the demand for manure spreaders, hay loaders, side delivery rakes, dump rakes, mowing machines, cultivators, harrows, and ensilage cutters.

Probably it will be possible for some farmers to delay another year in making desired replacements of old machinery; and some

of the farmers who expressed a need for additional new equipment may continue to get along temporarily without further mechanization. Nevertheless, it was considered that most dairymen made conservative estimates of their equipment needs, requesting only those items which they hoped to be able to purchase in order to conserve labor or to make possible an increased production of crops and livestock. As already shown in table 1, many of the larger dairy farms in Maine have not been mechanized very extensively. Such a step is extremely desirable on many farms during the war period in order to meet increased production goals, and will be es-

TABLE 6

Estimated Amount of Selected Kinds of Equipment Needed for Replacement and for Additional New Needs During the Last Half of 1943 and in 1944, and Approximate Amount of Equipment Allocated for 1943 and 1944, for 11,524 Farms in Maine Other Than in Aroostook County that Kept Three or More Dairy Cows

Kind of equipment	Per cent of farms having	No. of new equipment needed*			Approximate allocations for 1943 plus 1944†
		Replacements	Additional new needs	Total all needs	
Truck	49	156	121	277	202‡
Factory tractor	28	73	276	349	511
Manure spreader	42	381	739	1120	306
Hay loader	12	47	707	754	151
Side delivery rake	9	77	823	900	229
Dump rake	89	1137	205	1342	178‡
Mowing machine	89	1492	202	1694	640
Milking machine	23	148	551	699	877
Plow	90	767	288	1055	393§
Cultivator	90	669	413	1082	579
Harrow	91	1495	440	1935	781‡
Ensilage cutter	25	157	299	456	63

* The estimated amount of new equipment needed was computed by multiplying the total number of herds of each size group, as reported in the 1940 Census, by the average needs per 100 farms as summarized in tables 3 and 5. The total number of herds was 3,673 of three or four cows, 4,607 of five to nine cows, 1,965 of ten to fourteen cows, and 1,279 of fifteen or more cows. Estimated needs for 11,579 farms with only one or two cows were not included.

† The estimated amount of farm machinery allocated by the Maine AAA State Committee includes final allocations for 1943 plus estimated preliminary allocations for 1944 as of April 6, 1944. Basic information furnished through the courtesy of A. K. Gardner, Acting Secretary of State War Board.

‡ No allocations were established in 1944 for trucks, dump rakes, and springtooth harrows, but it was estimated that the available number of trucks and dump rakes might be the same as in 1943, and that the number of springtooth harrows might be increased 20 per cent. The number of trucks made available in 1943 was based on approvals made by the State Office of AAA.

§ Allocations for plows include only tractor-drawn or tractor-mounted plows, for which the demand was 322 for replacements, 121 for new needs, or a total of 443 for all needs. Horse plows were not rationed.

|| Allocations for cultivators do not include one-horse cultivators, which comprise 16 per cent of the estimated demand.

sential in the post war period in meeting the competition of the more efficient producers.

USE AND COSTS OF OPERATING AUTOS AND TRUCKS

The number of farmers in Maine who had autos and trucks increased rapidly from 1920 to 1930. The number having trucks increased somewhat more by 1940.⁵ The number of farmers in 1940 having autos was 22,701, and the number having trucks was 11,698. In 1940, autos were owned by 58 per cent of all the farmers as compared with 24 per cent in 1920. Trucks were owned by 30 per cent in 1940 versus 25 per cent in 1930 and 2 per cent in 1920. In comparison, the 1943 survey showed that 55 per cent of the farmers keeping dairy cows had autos and 54 per cent had trucks, with 83 per cent having an auto or truck.

The costs of operation, prior to wartime price advances since 1941, averaged 3.5 cents per mile for farm autos and one-half ton trucks, and 4.5 cents per mile for the larger farm trucks (table 7). Auto costs per mile included 1.35 cents for gasoline and oil; 1.34 cents for tires, repairs, and depreciation; and 0.77 cent for license, tax, insurance, interest, and miscellaneous. Farm truck costs per mile were 1.79 cents for gasoline and oil; 1.85 cents for tires, repairs and depreciation; and 0.83 cent for other costs. Costs for repairs were low because many farmers did much of their own repair work; depreciation was low because of the age and relatively low value of many autos and trucks; and miscellaneous costs were low because insurance was carried on only 32 per cent of the autos and 23 per cent of the trucks.⁶ The average mileage per gallon of gasoline was 16.7 miles for autos and 11.7 miles for trucks. The retail price of gasoline paid by farmers was 18.8 cents per gallon during the period of the survey, which was the same as the average

⁵ Agriculture, Maine, Second Series, Farm Mortgages, Taxes, Labor, Facilities, Expenditures, and Miscellaneous Farm Information, 1940 Census, p. 11. Bur. of Census, U. S. Dept. Commerce.

⁶ The average value of farm autos was \$122 and of farm trucks was \$187, which was relatively low because they were an average of about seven years old.

of 18.8 cents for the ten-year period of 1932-41 and 19.0 cents for 1941.⁷

TABLE 7

*Summary of Costs of Operating Autos and Trucks by Maine Dairy Farmers,
Based on Surveys in 1933 and 1934**

Item	Autos and ½ ton trucks	Trucks of one ton or more
Number of vehicles	290	109
Costs per vehicle annually	\$132	\$213
Miles annually per vehicle	3821	4767
Costs per mile, in cents:		
Gasoline	1.18	1.62
Oil	.17	.17
Tires	.20	.37
Repairs	.23	.33
Depreciation	.91	1.15
License and tax	.42	.49
Insurance, interest, miscellaneous	.35	.34
Total cost per mile	3.46	4.47
Miles per gallon of gas	16.7	11.7
Quarts oil per 1,000 miles	6.6	9.0
Cost per gallon gas, in cents	18.8	18.8
Cost per quart oil, in cents	22.7	22.7

* These surveys included 255 dairy farmers in the vicinity of Unity, Brooks, Belfast, and Union for the year ending April 30, 1933, and 110 farmers in the vicinity of Farmington, and 148 farmers near Portland for the year ending April 30, 1934.

Although these surveys were made some time ago, costs have not changed materially during the ten-year period immediately preceding the second World War.

Costs in the above table do not include the value of farm labor used in making repairs nor the cost for garage. These extra costs are estimated to amount to about 0.5 cent per mile.

The average age of autos and trucks used by farmers, according to both the 1940 Census and the 1943 survey, was approximately seven years. Nevertheless, fewer of the trucks in 1943 were one to three years old because of the wartime difficulty in buying new trucks. According to the 1943 survey, only 19 per cent of the farm trucks were one to three years old as compared with 30 per cent reported in the 1940 Census. More details concerning age already have been presented in table 2.

⁷ The trend in gasoline prices from 1932 to 1942 was obtained from L. D. Barrows, State Highway Commission, through the courtesy of the Standard Oil Co., price quotations for Hallowell, Maine. These prices, as quoted above, include the State tax which was four cents a gallon throughout the period, and also the Federal tax which was one cent a gallon, effective June 21, 1932, 1½ cents effective June 17, 1933, one cent effective January 1, 1934, and 1½ cents effective July 1, 1940.

The age of an auto or truck did not greatly affect the average cost of operation per mile travelled (table 8). The older vehicles had a much lower valuation and consequently had much less annual depreciation, but this saving in depreciation was nearly offset by the increased cost for repairs. The newer autos and trucks had about twice as much overhead cost per vehicle for insurance and taxes, but the cost per mile was not appreciably affected because the newer vehicles travelled about twice as much mileage each year. Gasoline costs per mile, as would be expected, were not appreciably affected by age of vehicle.

TABLE 8

*Relation of Age of Auto or Truck to the Costs of Operation, by Maine Dairy Farmers, Based on Surveys in 1933 and 1934**

Item	Auto or ½ ton truck			Truck of one ton or more		
	1-3 years	4-5 years	6 years or more	1-3 years	4-5 years	6 years or more
Costs per vehicle annually	\$202	\$137	\$91	\$306	\$176	\$107
Miles annually per vehicle	5906	3843	2834	6811	3820	2577
Costs per mile, in cents:						
Gasoline and oil	1.3	1.3	1.5	1.8	1.7	1.8
Tires, repairs, deprec.	1.5	1.5	1.0	1.9	2.0	1.4
Insurance, tax, misc.	.8	.8	.7	.8	.9	1.0
Total cost per mile	3.6	3.6	3.2	4.5	4.6	4.2

* See footnotes below table 7.

Approximately one-half of the farm trucks had a rated capacity of 1.0 or 1.5 tons; one-third were 0.5 or .75 ton capacity; and the remainder were 2.0 tons or slightly larger. The average cost of operating the smaller trucks was 3.5 cents per mile (about the same as for autos), and for the larger trucks of two tons or more was 4.7 cents per mile. The average mileage per gallon of gasoline for trucks of different capacity varied from 13.7 for one-half ton trucks, 10.8 for 1.5 ton trucks, and 8.5 miles per gallon for trucks of 2.5 tons or more.⁸

The average mileage travelled annually was 4,704 miles for autos and 7,494 miles for trucks, according to the most recent dairy farm survey in 1943. This average for trucks was considerably

⁸ Dow, George F. Costs and Returns in Operating Milk and Cream Collection Routes in Maine. Maine Agr. Exp. Sta. Bul. 374, p. 154. 1934.

more than that of 4,767 miles for farm trucks included in the dairy farm surveys made ten years earlier. Of the motor vehicles available on 500 farms in 1943, only 13 of the autos travelled more than 10,000 miles a year (the maximum was 30,000 miles by a dairyman who bought and sold cattle), and only 13 of the trucks travelled over 20,000 miles annually, much of which was work done off the farm. The newer autos and trucks travelled about twice as many miles annually as the older vehicles. Auto mileage did not vary appreciably with the size of herds, but annual truck mileage varied from 2,611 miles per truck with herds of only one or two cows to 7,993 miles per truck with herds of 20 or more cows (table 23).

An increase in the amount of mileage travelled resulted in a considerable increase in the annual cost of operating autos and trucks, but made a marked reduction in the average cost per mile. The costs for operating autos dropped from 5.3 to 2.5 cents per mile as annual mileage increased from under 2,500 to 7,500 or more. For trucks, a corresponding increase in mileage caused a decrease in costs from 8.2 to 3.6 cents per mile (table 9). The biggest savings in cost per mile were in overhead costs such as depreciation, insurance, and taxes.

TABLE 9

*Relation of Annual Mileage of Auto or Truck to the Costs of Operation, by Maine Dairy Farmers, Based on Surveys in 1933 and 1934**

Item	Annual mileage per vehicle			
	Under 2500	2500- 4999	5000- 7499	7500 and over
Autos:				
Number of autos	114	87	58	31
Annual cost per auto	\$75	\$135	\$163	\$273
Costs per mile, in cents:				
Gasoline and oil	1.5	1.4	1.3	1.3
Tires, repairs, depreciation	2.2	1.7	1.1	.8
Insurance, tax, miscellaneous	1.6	1.0	.6	.4
Total cost per mile	5.3	4.1	3.0	2.5
Trucks:				
Number of trucks	41	22	25	21
Annual costs per truck	\$98	\$184	\$229	\$419
Costs per mile, in cents:				
Gasoline and oil	2.0	1.7	1.6	1.8
Tires, repairs, depreciation	3.8	2.7	1.7	1.3
Insurance, tax, miscellaneous	2.4	1.2	.8	.5
Total cost per mile	8.2	5.6	4.1	3.6

* See footnotes below table 7.

The maximum mileage that might reasonably be expected from farm trucks was not estimated by farmers in the dairy surveys. However, if the average annual mileage in 1943 of 7,494 miles per truck were multiplied by 6.9 (the average age of trucks) the total estimated mileage to date would be nearly 52,000 miles per truck. This estimate may be slightly high in view of the probability that trucks in recent years have been used more extensively than in earlier years. Most of the trucks owned in 1943, however, were capable of additional mileage, as indicated by the fact that only three per cent of the trucks would need to be replaced by new trucks before the end of 1944. It is probable that the maximum mileage to be expected of most farm trucks is around 100,000 miles, but that some trucks with excellent care and adequate repairs may last up to 150,000 miles, while others with poor care, overloaded, or used on poor roads may last considerably less than 100,000 miles.

The average estimated number of new tires, recaps, or retreads needed by farmers from the summer of 1943 through 1944 was 1.2 per auto and 1.4 per truck. It was difficult for farmers to determine whether it would be necessary to have a new tire or whether a recap or retread could be used. Nevertheless, they estimated that 80 per cent of their total requirements for both autos and trucks should be new tires. The size of tires needed by two-thirds of the autos was 6.00-16, which refers to a six-inch tire with a wheel rim sixteen inches in diameter. Of the tires needed for trucks, 34 per cent were six-inch tires and 46 per cent were seven-inch tires. The rim size of 30 per cent of the truck tires needed was sixteen inches, and for 57 per cent was twenty inches.⁹

USE AND COSTS OF OPERATING TRACTORS

The number of tractors used on Maine farms has increased rapidly in the past 25 years. Census reports show that only 1.3 per cent of the farmers had tractors in 1920, as compared with 8.2

⁹ Tire sizes are sometimes confused because of two different methods of quoting size. For example, a 7.00-20 corresponds to a 32 x 6, and a 6.00-20 corresponds to a 30 x 5 tire. In the latter case, a 30 x 5 tire is a five-inch cord tire which has an outside diameter of 30 inches (wheel rim diameter of 20 inches), whereas a 6.00-20 is a six-inch balloon tire for the same wheel, with a wheel rim diameter of twenty inches.

per cent in 1930, and 19.3 per cent in 1940.¹⁰ Dairy farm surveys also indicate a similar trend, with 9 per cent of the farmers having tractors in 1933 and 1934, 18 per cent in 1937, and 49 per cent in 1943. This expansion has been caused by the purchase of factory-made tractors and by converting old autos into homemade tractors. In the 1943 survey, 34 per cent of the farmers had factory-made tractors as compared with 16 per cent having homemade tractors.

The extent to which tractors were used varied considerably by size of dairy herd and by acreage in tillage land. In 1943 only about one-fourth of the farmers that kept one or two cows had a tractor, as compared with nearly three-fourths of those with 20 or more cows (table 1). Also for the smallest herds, 63 per cent of the tractors were homemade in contrast with only 4 per cent for the largest herds. In the 1937 survey, only 1 per cent of the farmers with less than eight acres of land in tillage crops had tractors, as compared with 10 per cent for eight to fourteen acres, and 33 per cent for fifteen or more acres.¹¹

The use of tractors varied somewhat by areas, with relatively fewer tractors in Franklin, Hancock, Lincoln, and Washington Counties, and considerably more than average in Aroostook County (tables 19 and 24). In the 1943 survey of five areas, the homemade

TABLE 10

Variation in the Use of Tractors on 500 Farms Keeping Dairy Cows in 1943

Hours per year used tractor	Per cent of tractors		
	Home- made	Factory- made	All tractors
Under 200	11	5	7
200-300	41	13	22
400-500	34	22	26
600-700	8	21	17
800-900	4	12	9
1000 or more	2	27	19
All farms	100	100	100

¹⁰ Agriculture, Maine, Second Series, Farm Mortgages, Taxes, Labor, Facilities, Expenditures, and Miscellaneous Farm Information, 1940 Census, p. 11. Bur. of Census, U. S. Dept. Commerce.

¹¹ Tillage crops were considered as all crops for which the land was plowed, harrowed, and seeded during the year, including grain.

tractors were of most importance in the Franklin and Kennebec County areas, and of least importance in the Penobscot County area.

The average age of tractors used by dairy farmers in 1943 was 7.5 years for factory-made tractors and 14.1 years for homemade tractors. The age was closely associated with the amount of use, varying from an average of 19.9 years for factory-made tractors used less than 200 hours a year to 4.4 years for those used 1,000 or more hours.

The homemade tractors included in the 1943 survey were used an average of 408 hours a year, whereas the factory-made tractors were used 709 hours. On the farms with only one or two cows, the factory-made tractors were used an average of only 143 hours a year as compared with 925 hours for farms with twenty or more cows (table 23).

The average cost per hour for the operation of factory-made tractors was materially affected by the number of days that the tractor was used (table 11). Tractors that were used less than fifteen days a year had a cost of 97 cents per hour as compared with only 41 cents for those used 30 or more days. For all tractors, the average cost per hour was 51 cents, including 24 cents for gasoline and oil, 21 cents for repairs and depreciation, and 6 cents for

TABLE 11

*Relation of Annual Number of Days of Tractor Use to the Costs of Operation, by Maine Dairy Farmers, Based on Surveys in 1933 and 1934**

Item	Less than 15 days	15-29 days	30 days or more	All tractors
Number of tractors	16	13	19	48
Days used per year	9	18	41	25
Annual costs per tractor:				
Gasoline and oil	\$27	\$36	\$72	\$49
Repairs and depreciation	34	38	49	43
Grease, interest, miscellaneous	9	11	13	12
Total cost per tractor	\$70	\$85	\$134	\$104
Costs per hour, in cents:				
Gasoline and oil	36.5	24.3	22.1	24.4
Repairs and depreciation	46.3	26.0	14.8	21.0
Grease, interest, miscellaneous	14.2	7.4	3.9	5.9
Total cost per hour	97.0	57.7	40.8	51.3

* Tractor costs in the above table do not include the value of farm labor used in making repairs, the cost for garage, nor the property tax. In computing the estimated cost per hour, it was assumed that a tractor was used an average of eight hours per day. Depreciation was low because many tractors were old, having an average value of only \$222 per tractor.

grease, interest, and miscellaneous costs. These tractors required an average of 1.3 gallons of gasoline per hour, at an average price of 15.7 cents per gallon.¹² The amount of motor oil used was 1.5 quarts per day, at an average price of 20.6 cents per quart.

Three-fourths of the factory-made tractors had rubber tires on all four wheels, and a few others had rubber tires only on the rear or front wheels. Most of the tractors obtained in recent years were purchased with rubber tires. The earlier models had steel wheels, but some of these have been changed over to rubber tires. Of the tractors less than seven years old (manufactured in 1937-43), 90 per cent had rubber tires, as compared with 62 per cent for those 7 to 12 years old, and 40 per cent for those 13 or more years of age. All but two of the homemade tractors continued to use auto tires; the two exceptions had steel wheels on the rear.

New tire requirements for factory-made tractors were estimated to amount to 56 tires per 100 tractors, or about one front or rear tire for every two tractors. Homemade tractors required only 22 tire replacements per 100 tractors, for which secondhand tires usually were satisfactory.

USE AND COSTS OF KEEPING HORSES

One or more horses were kept on nearly one-half of all farms in Maine outside of Aroostook County, according to the 1940 Census classification of farms.¹³ This proportion for Maine is similar to that for all of New England, but is less than in Aroostook County and throughout most of the United States, where about three-fourths of the farmers kept one or more horses (table 12). Many of the smaller farmers in Maine who have relatively few acres of cultivated land do not have any horse, and either hire motive work done, or own a tractor.¹⁴ The farmers that kept horses had

¹² Farmers who made proper application to the State Bureau of Taxation obtained a refund of three cents per gallon of gasoline used by farm tractors, which accounts for the lower price of 15.7 cents as compared with that of 18.8 cents for gasoline used by autos and trucks.

¹³ The Census definition of a farm is one of 3 or more acres or producing farm products in 1939 valued at \$250 or more.

¹⁴ Dairy farm surveys show that most farmers who keep cows have one or more horses for farm use. In 1937 only 4 per cent of the dairy farmers in Central Maine, and only 16 per cent of those in Western Maine were without any horses.

an average of 1.7 horses per farm for Maine, other than in Aroostook County, as compared with 2.0 for New England and 3.0 for the United States.

TABLE 12

*Average Number of Horses Kept Per Farm and Per Acre of Cropland, in Maine and in Different Areas of the United States, 1940**

Area	Per cent of farms keeping horses	Number of horses per farm with horses	Acreage per horse	
			All cropland	In tillage crop†
State of Maine:				
Aroostook County	78	2.5	31	19
All but Aroostook	45	1.7	31	6
Entire State	50	1.9	31	10
New England	47	2.0	27	8
Middle Atlantic	66	2.5	23	13
North Central	77	3.4	33	27
Southern	72	2.5	20	18
United States	72	3.0	26	21

* Computed from Agriculture, United States, First Series, Uses of Land, Principal Crops and Classes of Livestock, 1940 Census. Bur. of Census, U. S. Dept. Commerce.

The term "horses" is used to include both horses and mules. Mules represent only 0.5 per cent of the total number in Maine, but 55 per cent of the total in the South.

† Tillage land was computed as all land used for crops, less all hayland other than small grain for hay.

Outside of Aroostook County, Maine's acreage in tillage crops was only six acres per horse (table 12). In Aroostook County where potatoes are grown intensively and many tractors are used on farms, there were 19 acres of land tilled per horse; in the North Central States 27 acres; and for the entire United States, 21 acres per horse. The average acreage of all cropland per horse, including hayland, was 31 acres for Maine as compared with 26 acres for the United States.

The number of horses on farms has declined rapidly during the past twenty years. On all Maine farms outside of Aroostook County, the number dropped from 70 thousand in 1920 to 44 thousand in 1930, and to 26 thousand in 1940.¹⁵ This decline, from 1920 to 1940, was 63 per cent for Maine (other than Aroostook County), as compared with a decline of 40 per cent for the United States. Some of this decline in the number of horses in Maine has been due to an 11 per cent decrease in the acreage of

¹⁵ Data from 1940 Census, same reference as below table 12.

cropland from 1930 to 1940. During this same period, however, the number of horses decreased 40 per cent, resulting in an increase in the average acreage of cropland per horse from 21 to 31 acres. It should not be inferred, however, that this trend resulted in additional work per horse, because many horses have been replaced by tractors and trucks. In 1940, only 45 per cent of the farms in Maine outside of Aroostook County had one or more horses per farm (using Census classification for a farm) as compared with 69 per cent in 1930. On many other farms where horses are kept, there also has been an increasing tendency to use tractors to supplement the work done by horses.

Many horses in Maine are used to a rather advanced age because the farm work usually is not very hard due to the small acreage in tillage crops. Very few colts are raised on Maine farms, and horses usually are kept as long as able to do the work. Over one-half of the horses kept on the Maine dairy farms included in the 1937 survey were 13 or more years of age, and nearly one-fourth were over 18 years old.¹⁶ The average age of all horses in the 1937 survey was 14.3 years. In Aroostook County, where more work usually is performed per horse than in the dairy areas, the average age of horses was 11.9 years.¹⁷

The average estimated value of horses used on dairy farms, according to several dairy farm surveys, was \$120 per horse, varying from \$100 in 1933 to \$143 in 1937 (table 25). The average price at which horses were purchased was \$160 per horse; the average price at which horses were sold by farmers was \$116. There was an annual turnover of approximately ten per cent in the total number of horses, of which five per cent died and the other five per cent were sold. Horses were kept on the same farm an average of ten years before they died or were sold. The average annual depreciation in the value of horses was \$6, due to death loss or sale below the purchase price.

The amount of grain fed per horse annually averaged 2,152 pounds (table 13). The smallest amount fed per horse in the dairy

¹⁶ More detailed data as to the ages of horses are as follows: 6 per cent under 7 years of age, 20 per cent at 7-9 years, 21 per cent at 10-12 years, 16 per cent at 13-15 years, 14 per cent at 16-18 years, 11 per cent at 19-21 years, and 12 per cent at over 21 years of age.

¹⁷ Schrupf, W. E. Unpublished data from a survey of 178 potato farms in Central Aroostook County in 1940.

areas surveyed was about 1,700 to 1,800 pounds in Androscoggin, Franklin, and Oxford Counties; and the highest amount was about 2,200 pounds in Waldo and Cumberland Counties. In areas such as Aroostook County, where home-grown oats are available and horses are worked much harder than in the dairy area, considerably more grain is fed, averaging 4,178 pounds per horse.¹⁸

Home-grown grain represented 36 per cent of all grain fed horses on the dairy farms, varying from a low of 11 per cent in Cumberland and Franklin Counties, to 20 per cent for Western Maine, 43 per cent for Waldo County, and a high of 58 per cent in Central Maine (including parts of Penobscot, Piscataquis, and Somerset Counties). Oats included 94 per cent of all the home-grown grain fed horses except in Cumberland and Franklin Counties where approximately one-fourth was home-grown corn. The price of grain was \$1.13 per cwt. in 1932-33; \$2.21 in 1936-37; an average of \$1.78 for all surveys; and an estimated \$3.40 for January, 1944.

TABLE 13

*Amount and Cost of Feed, Bedding, Horseshoeing, and
Depreciation Per Horse Annually, for 2,197 Horses
Included in Four Dairy Farm Surveys, from
1928 to 1937*

Item	Amount per horse	Cost per horse
Home-grown grain (lbs.)	781	\$14
Purchased grain (lbs.)	1371	24
Total all grain (lbs.)	2152	\$38
Total all hay (tons)	3.4	\$30
Total bedding (lbs.)	649	3
Total cost of feed and bedding		\$71
Expense for horseshoeing		7
Annual depreciation		6
Total of above costs		\$84

The average consumption of hay per horse was 3.4 tons annually, of which about three per cent was oats cut for hay. Horses received relatively little succulent feed, averaging only 39 pounds per horse annually. Only about 13 per cent of the horses

¹⁸ Same reference as footnote 17.

were pastured, and these were on pasture an average of only about one-half of the regular pasture season for cows. Bedding for horses amounted to an average of about one-third ton annually, much of which was sawdust which usually was obtained at a small cost.

The manure recovered from horses in the barn was estimated to be 7.5 tons per horse annually, valued at \$1.76 per ton. The value per horse for such manure was estimated to be approximately equal to miscellaneous expenses for veterinary, interest, taxes, and use of buildings and equipment for horses. No estimates were obtained for the value of labor in caring for horses.

The average annual cost for feed and bedding, during the time the surveys were made, was \$71 per horse, of which slightly over one-half was for grain. The annual cost for shoeing horses averaged about \$7 per horse. The total estimated cost annually for feed, bedding, depreciation, and horseshoeing was \$84 per horse during the prewar years of the survey; but would be approximately \$140 if based on prices for January, 1944.

COMPARATIVE EFFICIENCY OF VARIOUS KINDS OF TRACTIVE POWER

The number of horses kept per farm varied considerably among the 811 farms included in the dairy surveys of 1933 to 1937.

TABLE 14

Relation of Tractive Power to the Acreage in Tillage Crops,¹⁹ Based on Surveys of 811 Dairy Farms During 1933-37

Number of horses per farm	Average acreage of tillage crops per farm				
	Horses without truck or tractor	Horses with truck but no tractor	Horses with tractor but no truck	Horses with tractor and truck	All farms
One or less	4.0	5.3	8.6	8.9	4.9
Two	7.3	10.2	12.6	17.9	8.9
Three	9.6	13.6	14.0	18.7	11.7
Four or more	18.8	23.1	22.8	27.2	21.4
All farms	7.6	11.5	12.5	17.3	9.6

¹⁹ Tillage crops were considered as all crops for which the land was plowed, harrowed, and seeded during the year, including grain.

Seventeen per cent of the farms had one horse or less, 57 per cent had two horses, 20 per cent had three horses, and 6 per cent had four or more horses. The acreage of tillage crops varied from an average of 4 acres per farm having not over one horse to 19 acres for farms with four or more horses.

The farms that kept only horses for tractive power averaged only 7.6 acres of tillage crops per farm, as compared with 11.5 acres for horses and a truck, 12.5 acres for horses and a tractor, and 17.3 acres for horses with a truck and tractor (table 14).

An increase in the amount of tractive power used per farm tended to increase man labor efficiency (table 15). On many dairy farms, however, the acreage of tilled crops was relatively small so that the farm work could be performed readily with two horses, without much need for additional horses or for a tractor. Consequently, the saving in man labor on some farms was more than offset by the additional expense for the extra tractive power. Although labor income is affected by many factors, there was an indication that 2 horses were most economical on farms with three acres or less of tilled crops; 2 horses and a truck were best on farms with four to nine acres of tilled crops; and 2 horses, a truck, and a tractor were adapted to farms with 10 or more acres of tilled crops (table 15). In each group, the farmers who kept 3 horses

TABLE 15

Relation of Tractive Power to Labor Efficiency and Labor Income, for Groups of Farms with Different Acreage of Tilled Crops, 811 Dairy Farms During 1933-37

Tractive power used	Man work units per man,* with acres of tilled crops per farm of			Amount that labor income was above or below average, with acres of tilled crops of		
	3 acres or less	4 to 9 acres	10 or more acres	3 acres or less	4 to 9 acres	10 or more acres
0 or 1 horse	164	178	†	-\$45	-\$37	†
2 horses	177	192	223	+ 69	- 42	- \$1
3 horses	202	197	216	-223	- 97	-260
2 horses and truck	186	221	224	-107	+125	+146
2 horses, truck and tractor	†	†	245	†	†	+291
4 horses	†	†	276	†	†	+194

* Man work units represent the number of ten-hour days of work performed per man, computed on the basis of standard labor requirements per head of livestock or per acre of each crop.

† Figure omitted because of insufficient data, with less than 10 farms for the group.

had lower labor incomes than those having only 2 horses, indicating that under most conditions it was not economical to keep a third horse. Very few farmers use a three-horse hitch, but keep a third horse as an "extra" for odd jobs.

METHOD OF GETTING IN HAY AS RELATED TO LABOR REQUIREMENTS

The type of equipment used and size of crew caused considerable variation in the amount of labor required per ton for getting in hay during 1943. "Getting in hay" refers to loading in the field, hauling into the barn, and unloading. Seven farmers with a two-man crew who were getting in hay with only one horse and pitching hay on and off by hand, required 2.2 hours of time for the crew to handle a ton of hay. At the other extreme, there were 45 farmers with a three-man crew using hay loaders and hay-forks that required only 1.0 hour to get in a ton of hay.

Hay loaders were owned by only 16 per cent of the 500 farmers included in the 1943 survey, and were used on 18 per cent of the farms. However, on the larger farms with 20 or more cows approximately one-half of the farmers had hay loaders (table 1). When hay loaders were used, 17 minutes less time was required for getting in a ton of hay than when hay was pitched on by hand. A 17-minute saving in time by using a hay loader resulted in a reduction in man labor per ton of 34 minutes for a two-man crew and 50 minutes for a three-man crew (table 16).

Two-thirds of the farmers got in hay with a two-man crew, and one-third used three, or in a few cases, four men. The time required for getting in a ton of hay when two men pitched on by hand (with one man on the load), was 22 minutes less than when only one man pitched on. However, the three-man crew required a total of 32 minutes more man labor per ton than did the two-man crew. When a hay loader was used with a three-man crew (two on the load and one to drive), the crew time per ton of hay was 22 minutes less than with a two-man crew, but the total man labor was 15 minutes more per ton. Obviously, a three-man crew can get in more loads per day, averaging 29 per cent more hay than a two-man crew pitching on by hand, or 37 per cent more if using a hay loader. This saving in time is important if hay is to be

harvested quickly to preserve its quality. From the sole standpoint of labor efficiency, however, slightly less total man labor is used per ton of hay by a two-man crew than by a three-man crew.

The tractive power primarily used for hauling in hay was one horse by 9 per cent of the farmers, two horses by 50 per cent, a tractor by 15 per cent, and a truck by 26 per cent (table 26). The use of one horse, as compared with a two-horse team, required an average of 18 minutes longer per ton of hay, or 19 per cent additional time and man labor. In spite of this difference in favor of a two-horse team, it may be advantageous on some farms, if the land is relatively level and only two horses are available, to haul in hay with one horse while the other horse is used for raking. The use of a relatively large truck in place of a two-horse team apparently saved a small amount of labor, but the difference is not very significant. The time required for hauling in hay with a tractor was identical to that with a two-horse team (table 16). If a two-horse team is available, which is not being used for mowing, raking, or other farm work, it usually is cheaper to haul in hay with horses than to operate a tractor or truck. This fact was recognized by 38 farmers, who sometimes used horses and at other times a tractor



FIG. 2. Horses are Used for Hauling in Hay by 60 Per Cent of the Maine Dairymen, and are as Economical as Trucks or Tractors for Relatively Short Distances.

or truck for hauling in hay, depending primarily upon the availability of the horses, or in a few instances, on the length of haul from hayfield to barn. When using a hay loader, however, the use of a tractor or truck may be of some advantage in adjusting to a uniform rate of speed most efficient in making the load.

Only five per cent of the farmers pitched off hay in the barn by hand; the other 95 per cent used hayforks. The average saving per ton of hay from using a hayfork was 20 minutes in time, or 41 minutes in total man labor. About four per cent of the farmers also used slides in their barn so that hay would slide down directly from the hayfork carrier into the mow. Such slides were especially well adapted to barns with a high roof, and made unloading and storing hay much easier.

TABLE 16

Relation of Method of Getting in Hay to the Time Required and Amount of Man Labor Per Ton, on 489 Farms in Maine in 1943.*

Method used	Hours per ton of hay		Savings in minutes per ton	
	For crew	Total man labor	For crew	Total man labor
2 man crew:				
No hay loader	1.61	3.22		
Hay loader	1.33	2.66	17	34
3 man crew:				
No hay loader	1.25	3.75		
Hay loader	.97	2.91	17	50
No hay loader:				
1 pitch on, 1 on load	1.61	3.22		
2 pitch on, 1 on load	1.25	3.75	22	-32
Hay loader used:				
1 on load, 1 drive	1.33	2.66		
2 on load, 1 drive	.97	2.91	22	-15
2 man crew but no hay loader:				
1 horse	1.89	3.78		
2 horses	1.59	3.18	18	36
Use of:				
2 horses	1.51	3.50		
1 truck	1.40	3.25	7	15
Use of:				
2 horses	1.51	3.50		
1 tractor	1.51	3.50	0	0
Pitch off hay:				
By hand	1.82	4.11		
By hayfork	1.48	3.42	20	41
Average all methods	1.39	3.26		

* Eleven farms were not included because hay was hired cut or data were incomplete.

If two children were used on the load in place of one man, they were counted as only one.

For each group used, additional subgroups were made to be certain that other factors did not influence labor requirements and thus distort the comparison.

Large homemade buck rakes were used during 1943 by three of the farmers interviewed, with a substantial saving in labor. A three-man crew was used, one to operate the buck rake, one in the mow, and one to operate the hayfork. With this crew, only 40 minutes was required to get in a ton of hay, as compared with 83 minutes for the other farmers. The buck rake, in addition, gathered the hay direct from the swath, eliminating extra labor for raking hay. However, unless the fields are smooth and hay yield relatively heavy, probably the buck rake would not be used for raking. The use of the buck rake not only saved labor, but required less heavy work and resulted in better quality roughage. The quality was improved because fewer leaves were lost, and because the haying season was shortened. A homemade buck rake may be built at a relatively low cost and is best adapted to fields relatively near the barn. A grapple fork or sling is necessary, however, in place of a harpoon fork because of the loose condition of the hay.

The use of labor saving equipment such as buck rakes, hay loaders, hayforks, and slides is especially important during the haying season when the demand for labor is at a peak. It is important not only to save labor but to get in the hay quickly in order to have top quality roughage. A delay in cutting hay beyond the optimum date results in lower quality, resulting in higher grain costs or lower milk production per cow. The need for more efficient haying methods is indicated by the large proportion of farmers whose hay is not all cut by August first, or even by August fifteenth. Among the 500 dairymen interviewed in the summer of 1943, there were 68 per cent who had not finished haying by August first in 1942, and 77 per cent for the same date in 1943. Those who were still haying after August fifteenth included 12 per cent of the farmers in 1942 and 29 per cent in 1943. The average date when haying was completed was August third in 1942 and August ninth in 1943. The extra delay in 1943 was due not only to the labor shortage and the increased production of canning crops and potatoes, but in part to extremely poor hay weather during the latter part of the season. But if the 1942 figures are taken as more nearly normal, it is apparent that there is a considerable volume of extremely late cut hay in Maine which must be high in fibre and low in food value. The question of obtaining more efficient haying equipment, therefore, is one of better quality roughage as well as saving labor.

USE OF MILKING MACHINES AND EFFECT ON LABOR REQUIREMENTS

Milking machines were used by approximately one-third of the farmers included in the 1943 dairy survey. The proportion using machines was 84 per cent in herds of 20 or more cows, 56 per cent for 10 to 19 cows, 14 per cent for 5 to 9 cows, and none used in herds of less than 5 cows (table 1).

The number of Maine farmers using milking machines has increased rapidly in the last five years. Dairy surveys, including 811 farms during 1933 to 1937, showed only 11 per cent of the herds milked by machine, as compared with 35 per cent for the 1943 survey. This proportion will continue to increase further as machines become available. Ten per cent of the farmers who milked by hand in 1943 desired to obtain milking machines, including 24 per cent of those with 10 to 14 cows, and 32 per cent of those with 15 or more cows.

Electric power was used for operating nearly three-fourths of the milking machines, and gasoline engines for one-fourth. On farms where electricity was not available, the proportion of farmers using milking machines was only about one-half as large as on farms having electric power.

Milking machines reduced the labor required for milking by 31 per cent, which amounted to 26 hours per cow annually, or 4.3 minutes per cow daily.²⁰ The labor for washing equipment, however, was increased slightly when a milking machine was used. The net saving from using a machine was thereby reduced to 25 per cent of the total labor, or 24 hours per cow annually, or about 4.0 minutes per cow daily. This is equivalent to saving one hour daily for doing chores in a herd of 15 cows if a dairyman shifts from hand to machine milking.

The average value of milking machines, allowing for depreciation due to use, was \$188 per herd. Operating costs such as for electricity, repairs, and depreciation were not determined in this

²⁰ The actual labor requirement annually per cow milked by machine was 59 hours, which was 35 per cent less than the average of 90 hours per cow milked by hand. More of the cows milked by hand, however, were in the smaller herds which were less efficient in the use of labor. The average saving from machine milking, after adjusting for differences in the size of herds, was 31 per cent instead of 35 per cent.

survey, but the usual assumption is that the saving in labor from machine milking more than offsets the operating costs in herds of ten or more cows. The estimated value of labor saved during a year in a ten-cow herd would be \$41 at wage rates prevailing in 1935-39, or \$90 at 1943 rates. These savings are sufficient to offset a considerable investment in equipment and operating costs. Another factor which during the war has increased the demand for milking machines, even in some of the smaller herds, has been the shortage of farm labor with the necessary skill or strength for hand milking.

METHOD OF WATERING DAIRY COWS AND EFFECT ON LABOR AND MILK PRODUCTION

Cows were watered in 19 per cent of the herds from individual drinking cups, in 11 per cent of the herds by a trough directly in front of the cows, in 27 per cent of the herds by turning cows loose to a tub of water in the barn, in 16 per cent by carrying water in pails to the cows, and in the remaining 27 per cent by turning cows outdoors to a tub in the yard or to a spring or brook (table 17). In the larger herds there was more of a tendency to use drinking cups; with an average of 14.2 cows per herd when watered from cups, as compared with 11.4 cows for a trough in front of cows, and 8.7 cows for all other methods.

TABLE 17

Relation of Method of Watering Cows to Labor Requirements and Milk Production Per Cow, Based on Surveys of 811 Dairy Farms During 1933-1937

Method of watering	Per cent of all herds	Number of cows per herd	Hours per cow for misc. chores*	Pounds of milk per cow
Drinking cups	19	14.2	87	5334
Trough in front of cows	11	11.4	89	5019
Tub in barn	27	9.0	112	4858
Carry in pails	16	8.7	109	4981
Watered outdoors	27	8.5	113	4479
All methods	100	10.1	101	4935

* Hours annually per cow for labor other than for milking; includes time for feeding, watering, and cleaning out the barn.

The use of drinking cups, making water available at all times, not only saved labor but resulted in greater milk production per cow. The herds watered from cups required only 87 hours per cow annually for doing chores other than milking, as compared with an average of 112 hours when cows were watered with pails or turned loose to a tub in the barn or outdoors. In a ten-cow herd such a saving in labor would amount to approximately 40 minutes a day, or a reduction of one-fifth of the labor required. The annual milk production of cows that had water available at all times was about 400 additional pounds per cow, or an increase of eight per cent above that of cows watered in the barn once or twice a day.²¹ Cows that were turned outdoors to obtain their drinking water produced nine per cent less milk than those watered in the barn once or twice a day. Another survey made in 1929 indicated that the cows which were turned loose to be watered in the barn twice a day, instead of only once, required more labor but produced more milk.²² When cows were watered outdoors, however, the extra exposure to cold weather apparently offset the advantage of being watered twice a day.

Available information indicates that the use of drinking cups in the larger herds is a practical investment if running water can be made available at a reasonable cost without danger of freezing. The saving in labor and the additional production of milk should more than offset the extra investment cost for drinking cups on many farms.

USE AND AVAILABILITY OF ELECTRICITY

The availability of electricity on the farm is an important factor in using some kinds of labor saving equipment such as milking

²¹ Some of this difference might be due to other factors than method of watering, but the difference is not much greater than reported by F. B. Morrison in *Feeds and Feeding*, p. 507: "In trials by the United States Department of Agriculture and the Iowa and Connecticut Stations, good cows watered with drinking bowls produced 3.5 to 4.0 per cent more milk than those allowed to drink all the water they wished twice a day, and 6 to 11 per cent more than those watered once a day."

²² Dow, George F. *Costs and Returns in Producing Milk, Raising Heifers, and Keeping Herd Bulls in Maine*. Maine Agr. Exp. Sta. Bul. 361, p. 94. 1932.

machines and water pumps. Gasoline engines may be used, but are not as convenient or satisfactory in many ways as electric motors. Electric lights also are superior to kerosene lanterns because of convenience and presumably greater speed in doing chores when the barn is well lighted. Electric lights also may be less of a fire hazard if properly installed.

The 1940 Census shows that an average of 54 per cent of all farms in Maine have electricity, but there was considerable variation in different areas. About 73 per cent of the farms in Androscoggin, Cumberland, and York Counties were electrified as compared with about 64 per cent in Knox and Kennebec, about 50 per cent in Oxford and Penobscot, about 45 per cent in Somerset and Franklin, and about 37 per cent in Piscataquis and Waldo Counties.²³ Dairy farm surveys show that about one-half of the dairymen in the wholesale milk areas supplying the Boston market have electricity, whereas about 80 to 85 per cent of the producers supplying local Maine markets have electricity.

The electrification of Maine farms has increased rapidly from 10 per cent of all Census farms in 1920, to 33 per cent in 1930, and to 54 per cent in 1940. Of all farms within one-fourth mile of a power line, 87 per cent were using electricity in 1940.

Many of the larger herds in Maine are milked by machine, utilizing electricity, as already indicated in another section of this report. Electricity also may be used for refrigeration in cooling milk, thereby saving labor and expense in harvesting ice in winter, and the time and inconvenience of icing the refrigerator during the summer. Until recently, however, relatively few dairymen have shifted over from ice to electric refrigeration because of the extra investment and the fact that farm labor often is available for harvesting ice during the winter without much extra expense. Dairy surveys made during 1928 to 1937 show that only one or two per cent of the dairymen in the Boston milkshed had electric refrigeration.

²³ Agriculture, Maine, Second Series, Farm Mortgages, Taxes, Labor, Facilities, Expenditures, and Miscellaneous Farm Information, 1940 Census, pp. 19 and 20. Bur. of Census, U. S. Dept. Commerce.

INVESTMENT IN FARM MACHINERY ON DAIRY FARMS

The average value of farm machinery, after allowing for depreciation, was 10 per cent of the total value of farm capital (table 18). There was considerable variation in machinery investment, however, among the farms included in these surveys, because of the type and size of farm business, as well as numerous other factors. The specialized dairy farms in 1937 had an average valuation for machinery of \$445 per farm, in contrast to \$911 for farms with a large acreage of cash crops as well as a dairy herd.²⁴ A summary of the machinery investment per farm on 556 dairy farms during 1934 to 1937 showed less than \$200 for 21 per cent of the farms, \$200 to \$599 for 44 per cent, \$600 to \$999 for 21 per cent, and \$1000 or more for 14 per cent.

TABLE 18

Average Value Per Farm for Investment in Machinery, Horses, and Other Items of Farm Capital, Based on Surveys of 989 Dairy Farms in Maine from 1928 to 1937

Items of farm capital	Average value per farm	Per cent of total capital
Buildings	\$2738	40
Land	2182	32
Machinery	668	10
Horses	266	4
Cows and other livestock	894	13
Feed and supplies	67	1
Total capital	\$6815	100

The average annual expenditure per farm for new machinery was \$39 for all farms, but varied annually from only \$10 during the 1933 depression to \$55 in 1937. The average cost per farmer that bought new machinery during the year was \$160, varying from \$94 in 1933 for 10 per cent of the farmers, to \$205 in 1937 for 27 per cent of the farmers.

²⁴ Computed from information in Maine Agr. Exp. Sta. Buls. 398 and 408, pp. 64 and 110, by Andrew E. Watson and Emil Rauchenstein. The Organization and Management of 95 Dairy and Cash Crop Farms in Androscoggin and Oxford Counties, Maine; and Farm Management on Central Maine Farms with Dairy Enterprises.

The additional expense for machinery repairs averaged \$13 per farm annually, and varied from \$8 to \$19 between 1933 and 1937.

To what extent should Maine dairymen increase their investment in machinery in so far as machinery is available? Available information indicates a gradual long-time trend for larger farms and increased mechanization. In general, the economical efficient use of machinery depends upon a relatively large volume of production to be handled. In addition, before purchasing additional machinery the farm operator should consider the following factors in determining whether the extra investment will be profitable:

Will the equipment make possible an increase in production? How many more cows can be kept if milked by machine instead of by hand; or how many more acres of tillage crops can be handled with a tractor?

How much labor can be saved? Will the reduction in cost for hired help more than offset the extra cost for the equipment?

What effect will increased mechanization have on the quality of production? Will better haying equipment shorten the haying season and result in improved quality of roughage?

In order to meet competition in the post war period, it probably will be necessary for many of the smaller dairy farmers to continue to improve their efficiency of production by operating larger units, using more labor saving equipment, and improving the quality of the roughage used for feeding the dairy herd.

SUMMARY

A survey in 1943 of 500 farms with dairy cows showed that trucks, tractors, and manure spreaders were used by about one-half of the farmers, milking machines by one-third, and hay loaders by one-sixth. Of the farmers with 20 or more cows, 87 per cent had manure spreaders, 84 per cent had milking machines, 69 per cent had factory-made tractors, and 48 per cent had hay loaders. Relatively few of the smaller farms with less than 5 cows had such labor saving equipment.

Much of the equipment was old, averaging 7 years for autos, trucks, and factory-made tractors, 10-11 years for hay loaders and manure spreaders, and 14 years for dump rakes.

Estimated equipment needs for replacement purposes and for new additional machinery were determined by size of herds. A general comparison of equipment needs for Maine other than in Aroostook County, in contrast to the total of machinery allocations, indicates that demand is considerably in excess of supply for manure spreaders, hay loaders, side delivery rakes, dump rakes, mowing machines, cultivators, harrows, and ensilage cutters.

The proportion of farmers having motorized equipment, according to Census data, increased during 1920 to 1940 from 24 to 58 per cent for autos, from 2 to 30 per cent for trucks, and from 1 to 19 per cent for tractors. On farms keeping dairy cows, the increase in trucks and tractors has been considerably greater. The cost of operation, according to surveys made prior to the wartime advance in prices, averaged 3.5 cents per mile for autos, 4.5 cents per mile for trucks, and 51 cents per hour for tractors. An increase in the annual amount of use reduced the unit cost of operation from 5.3 to 2.5 cents per mile for autos, from 8.2 to 3.6 cents per mile for trucks, and from 97 to 41 cents per hour for tractors.

The number of horses kept on Maine farms other than in Aroostook County has declined 63 per cent from 1920 to 1940, with some replacement by tractors and trucks. Very few colts are raised and many horses are old, averaging about 14 years of age for all horses. The turnover in number of horses was 10 per cent of which one-half were sold and one-half died. Average annual feed requirements per horse on dairy farms was 2152 pounds of grain and 3.4 tons of hay. Approximately two-thirds of the grain was purchased.

Seventeen per cent of the dairy farms had 1 horse or less, 57 per cent had two horses, 20 per cent had three horses, and 6 per cent had 4 or more horses. The average acreage of tillage crops per farm was 7.6 acres for those keeping only horses for tractive power, 11.5 acres for horses and a truck, 12.5 acres for horses and a tractor, and 17.3 acres for horses with a truck and tractor.

In haying, the time required by the crew for getting in a ton of hay was 17 minutes less when using a hay loader, was 22 minutes less when a three-man crew was used in place of a two-man crew, was 18 minutes less when two horses were used instead of only one, and was 20 minutes less when using a hayfork instead of pitching off by hand. A few farmers who had started to use buck rakes made a substantial saving in labor. The use of labor saving

equipment during the haying season is of special importance because of the need to improve the quality of roughage. Of 500 dairymen interviewed, 68 per cent did not finish haying before August 1 in 1942 and 77 per cent for the same date in 1943.

A milking machine reduced the labor required for milking cows by 25 per cent, which was equivalent to saving one hour daily in a herd of 15 cows. The estimated value of the labor saved annually in a ten-cow herd would be \$41 at wage rates prevailing in 1935-39, or \$90 at 1943 rates.

Drinking cups or a trough in front of the cows, reduced the labor requirements about 40 minutes per day in watering a ten-cow herd, in contrast to watering in pails or turning cows loose to drink at a tub. Milk production per cow was increased by having water available at all times in drinking cups, and was decreased when cows were watered outdoors during cold weather.

Electricity was available on about one-half of the dairy farms in the wholesale milk areas of the Boston milkshed, and on about 80 per cent of the farms supplying milk for local markets. Electricity is advantageous as a source of light and in the operation of such equipment as milking machines and water pumps. Dairy surveys indicate, however, that only about 2 per cent of the dairymen in the Boston milkshed have changed from ice to electric refrigeration.

The average value of farm machinery, allowing for depreciation, was \$668 per farm during 1928 to 1937 or 10 per cent of total farm capital. The extent to which dairymen should increase their investment in farm machinery depends considerably upon the size of herd and type of farm. Other important factors in determining whether additional equipment will be profitable, include the questions of how much labor can be saved, how much will production be increased, and to what extent will the quality of production be improved. In the post war period, more efficient production probably will be necessary and will result in a continued trend for increased production per farm, and in the use of more labor saving equipment.

APPENDIX TABLES

TABLE 19

*Proportion of Farmers Having Selected Kinds of Equipment, by Areas,
for 500 Farms Keeping Dairy Cows in 1943*

Kind of equipment	Per cent of all farmers					
	Waldo County area	Franklin County area	Cumberland County area	Kennebec County area	Penobscot County area	All five areas
Auto	45	48	67	56	57	55
Truck	43	62	61	54	49	54
Auto or truck	75	86	91	81	81	83
Factory tractor	37	23	40	32	37	34
Homemade tractor	16	23	14	26	4	16
All tractors	51	45	54	57	40	49
Manure spreader	57	33	53	44	65	51
Hay loader	21	5	6	11	33	16
Side delivery rake	17	4	8	8	25	13
Dump rake	91	94	94	89	86	91
Mowing machine	93	93	88	89	92	91
Milking machine	50	27	43	21	39	35
Plow	93	86	92	91	94	91
Cultivator	89	90	89	88	96	91
Harrow	91	91	91	90	89	90
Ensilage cutter	31	50	25	37	31	35
Sprayer or duster	30	12	10	10	44	21
Potato digger	43	11	10	8	48	23
Thresher	13	10	9	11	19	13
Hayfork	93	90	93	94	98	94
Number of herds	100	100	100	90	110	500
No. cows per herd	11.1	9.8	13.7	9.8	10.2	10.9

TABLE 20

*Average Age of Selected Kinds of Equipment, by Size of Herd, for 500 Farms
Keeping Dairy Cows in 1943*

Kind of equipment	Average age of equipment in years, in herds of				
	1-4 cows	5-9 cows	10-14 cows	15 or more cows	All herds
Auto	7.9	7.6	7.2	6.0	7.1
Truck	9.3	7.1	7.3	6.0	7.0
Factory tractor	11.3	8.8	6.8	6.7	7.5
Homemade tractor	14.5	14.0	14.1	13.5	14.1
Manure spreader	12.1	12.0	12.2	10.3	11.5
Hay loader	*	12.2	10.8	9.4	10.4
Side delivery rake	*	11.1	8.8	9.3	9.4
Dump rake	16.3	16.0	13.5	11.8	14.4

* Average age omitted because of an insufficient number of equipment on these smaller farms.

TABLE 21

Estimated Number of Selected Kinds of New Equipment Needed Per 100 Farms for Replacement Purposes During the Last Half of 1943 and in 1944, by Areas

Kind of equipment	Number of replacements per 100 farms					
	Waldo County area	Franklin County area	Cumberland County area	Kennebec County area	Penobscot County area	All five areas
Truck	2	1	2	1	3	2
Tractor	—	—	2	2	2	1
Manure spreader	4	5	2	3	9	5
Hay loader	2	—	2	—	—	1
Side delivery rake	1	—	2	—	3	1
Dump rake	5	11	12	7	6	8
Mowing machine	11	10	10	10	9	10
Milking machine	5	2	—	2	1	2
Plow	10	6	5	4	8	7
Cultivator	2	3	9	2	9	5
Harrow	7	6	11	10	18	11
Ensilage cutter	1	1	2	1	4	2
Corn planter	1	2	—	2	—	1
Sprayer or duster	1	—	—	—	3	1
Potato digger	1	—	—	—	1	—
Number of herds	100	100	100	90	110	500

TABLE 22

Estimated Number of Selected Kinds of New Equipment Needed Per 100 Farms for Replacements and for New Needs During the Last Half of 1943 and in 1944, by Areas

Kind of equipment	Number of equipment needed per 100 farms					
	Waldo County area	Franklin County area	Cumberland County area	Kennebec County area	Penobscot County area	All five areas
Truck	4	3	2	2	4	3
Tractor	5	—	9	3	5	4
Manure spreader	8	7	12	7	17	10
Hay loader	9	6	9	9	13	9
Side delivery rake	5	6	12	11	21	11
Dump rake	6	12	14	8	11	10
Mowing machine	13	10	17	12	11	13
Milking machine	10	11	4	8	9	8
Plow	11	11	10	6	9	9
Cultivator	4	8	16	7	9	9
Harrow	12	9	18	13	24	15
Ensilage cutter	3	5	7	2	8	5
Corn planter	2	4	3	4	2	3
Sprayer or duster	3	—	3	—	4	2
Potato digger	3	—	1	—	3	1
Hayfork rope, 100 ft.	36	45	50	41	24	39
Fence wire, 80 rod rolls	111	130	175	116	232	155

TABLE 23

*Relation of Size of Dairy Herd to the Use of Auto, Truck, and Tractor
During the Year 1942-43*

Number of cows per herd	Number of herds	Average annual use			
		Miles per auto	Miles per truck	Hours per tractor	
				Factory-made	Homemade
1-2	30	4485	2611	143	227
3-4	55	3936	5554	418	496
5-9	178	4763	8126	639	377
10-14	127	4833	7859	622	469
15-19	49	3652	6775	786	333
20 or more	61	5595	7993	925	400
All herds	500	4704	7494	709	408

TABLE 24

*Proportion of All Farmers Having Auto, Truck, Tractor, and Electricity,
by Counties, in 1940**

County	Per cent of all farmers having			
	Auto	Truck	Tractor	Electricity
Androscoggin	59	26	21	71
Aroostook	61	46	36	52
Cumberland	64	32	23	77
Franklin	57	29	13	45
Hancock	52	23	11	56
Kennebec	61	29	20	64
Knox	55	28	17	63
Lincoln	59	24	11	54
Oxford	61	33	17	52
Penobscot	54	25	14	50
Piscataquis	54	23	14	36
Sagadahoc	61	30	24	52
Somerset	54	27	16	44
Waldo	52	22	16	37
Washington	49	20	3	34
York	73	34	26	70
All of Maine	58	30	19	54

* Agriculture, Maine, Second Series, Farm Mortgages, Taxes, Labor, Facilities, Expenditures, and Miscellaneous Farm Information, 1940 Census, pp. 19-20. Bur. of Census, U. S. Dept. Commerce.

TABLE 25

*Average Number of Horses Per Farm, Value Per Horse, and Annual Depreciation, for Four Dairy Surveys Including a Total of 2,197 Horses Kept on 989 Dairy Farms in Maine**

Item	All surveys	1937 survey	1934 survey	1933 survey	1928 survey
Number of horses per farm	2.2	2.0	2.1	2.3	2.9
Per cent of all horses:					
Died during year	5.0	3.5	8.2	5.2	3.0
Sold during year	5.5	8.2	4.0	2.9	7.2
Average value per horse	\$120	\$143	\$109	\$100	\$128
Av. price per horse purchased	160	189	144	113	172
Av. price per horse sold	116	116	94	108	132
Annual depreciation per horse	6	3	8	6	4

* The areas included in the 1933 and 1934 surveys are described in the footnote below table 7 in the text of this report; the 1928 survey covered five of the more important dairy areas of Maine; that in 1937 included 95 farms in Androscoggin and Oxford Counties, and 203 farms in Central Maine including parts of Penobscot, Piscataquis, and Somerset Counties.

TABLE 26

Combinations of Number of Men and Tractive Power Used in Getting in Hay on 489 Farms in Maine in 1943

Principal method used	Number of farmers		Per cent of all farmers		
	Pitch on by hand	Use hay loader	Pitch on by hand	Use hay loader	Total per cent
1 horse and 2 men	45	—	9.2	—	
1 horse and 3 men	1	—	.2	—	9.4
2 horses and 2 men	170	26	34.8	5.3	
2 horses and 3 men	46	4	9.4	.8	50.3
1 tractor and 2 men	31	4	6.3	.8	
1 tractor and 3 men*	25	12	5.1	2.5	14.7
1 truck and 2 men	37	15	7.6	3.1	
1 truck and 3 men*	44	29	9.0	5.9	25.6
Total all methods	399	90	81.6	18.4	100.0
Total using 2 men	283	45	57.9	9.2	67.1
Total using 3 men*	116	45	23.7	9.2	32.9
Total pitch off by hand	23	—	4.7	—	4.7
Total use hayfork	376	90	76.9	18.4	95.3
Total use slides in barn	13	5	2.7	1.0	3.7
Total use no slides	386	85	78.9	17.4	96.3

* Includes a four-man crew on one farm using a tractor, and on seven farms using a truck.

BULLETIN 430

A FOUR-YEAR STUDY OF THE FOOD HABITS AND PHYSICAL CONDITION OF GRADE- SCHOOL CHILDREN IN NEWPORT, MAINE¹

MARY M. CLAYTON

INTRODUCTION

The war has brought about certain changes in food production and consumption in Maine which no doubt already have had some effect on the general health and nutrition of the people. A general shortage of certain items, such as meat, might be expected to have a detrimental effect unless adequate substitutes are both available and consumed in sufficient quantity. However, a number of factors have been operating which have probably been favorable. Among these can be mentioned the following: increased income for many families; increased interest in food values (as a result of educational programs and food rationing); the availability of nutritious new foods, such as the soy products; the enrichment of cereal products; an increase in the number and size of home gardens; increased food preservation; and the development of the hot school lunch program. If the present general interest in health and nutrition can be maintained after the war there is reason to expect that nutritional defects which have been so common in the past may greatly decrease.

The present study gives a report of nutrition surveys of grade-school children which were made in four Maine towns between the years 1934-40. The results indicate that there is much which can be done to improve the health and nutrition of present and coming generations of Maine children.

¹ Including comparisons with findings secured in three other Maine towns.

PREVIOUS STUDIES OF THE FOOD HABITS AND PHYSICAL CONDITION OF MAINE CHILDREN

In the fall of 1934 and spring of 1935 the Home Economics Department of the Maine Agricultural Experiment Station conducted a survey of the food habits and nutritional status of grade-school children in three Maine towns: Mars Hill, Jonesport, and Monmouth.² This survey gave evidence of the prevalence of the following types of nutritional defects in the three towns studied:

1. Bone defects resulting from rickets in infancy.
2. Malocclusion and dental caries.
3. Inflamed gums and other evidence of vitamin C deficiency.
4. Anemia.
5. Underweight.

The prevalence of vitamin C deficiency in a northern Maine town was also shown in recent studies by Crane and Woods (1941) and Murphy (1941).

The Experiment Station survey also gave evidence of some differences in the frequency of the occurrence of certain types of nutritional defects in the children of the different towns. This was to be expected, owing to differences in agriculture, industry, transportation facilities, and climate in the areas of the State represented.

PLAN FOR PRESENT STUDY

PURPOSE

The present four-year study, made in Newport, Maine, is partly a continuation of the survey previously reported (Clayton, 1940). However, in addition to satisfying the need for similar data from a fourth town located in a different type of environment, it seemed desirable to follow the food habits and physical condition of the same group of children over a period of years, in order to determine the effect of such factors as health education and changing economic conditions. Also, since several studies have recently been

² In Mars Hill the studies were continued in 1935-36 and 1936-37. The data secured in all three towns between fall 1934 and spring 1936 have been reported by Clayton (1940).

published in which consecutive physical measurements were made on the same groups of children (Meredith, 1935; Boynton, 1936; Dearborn et al., 1938; Jones and Bayley, 1941), the present study offered the opportunity to compare data for the growth and development of a group of Maine children with those secured in other states. In the present paper some of the findings for Newport will also be compared with those for the other three Maine towns and emphasis will be given to those which are of special importance to the future health of Maine people.

CHOICE OF LOCATION

The town of Newport, situated on the southwestern border of Penobscot County, was chosen for the following reasons: It is in a different area of the State and is of a somewhat different type from the towns previously studied; it has a grade school with a sufficiently large enrollment (approximately 250) to provide an adequate group for study; it is located within convenient traveling distance of Orono. In 1940 the population of the town of Newport was 2,052. Employment opportunities in the village include those offered by a shoddy mill, a saw mill, a wood turning factory, and a milk plant. Many small farms and several dairies are in the outlying districts. During the period when this study was made there was considerable unemployment in the town and many families were receiving town or W.P.A. assistance. The children attending the grade school came from the village and outlying districts.

PERSONNEL

The study was carried on by the writer with the assistance of George I. Higgins, M.D., of Newport and Walter L. H. Hall, M.D., of Old Town; Dorothy Bryant, D.H., Associate Director Division of Dental Health, State Department of Health and Welfare, and Philip W. Woods, D.D.S., Director, Division of Dental Health, State Department of Health and Welfare.

DATA SECURED

The data secured include the results of physical examinations (Form 1, Appendix), physical measurements (Form 1, Appendix),

dental examinations (Form 2, Appendix), vitamin C studies, information secured at home visits (Form 3, Appendix), and diet records kept by the children at school (Form 4, Appendix).

ORDER OF WORK

1936-37. Work at Newport³ was begun in the fall of 1936 with physical examinations by Dr. Higgins, physical measurements by the writer, and dental (teeth and gums) examinations by Miss Bryant. Also, for one week in the fall, all of the children above the third grade kept diet records at school. Only the physical measurements were repeated in the spring.

1937-38. Physical and dental examinations and physical measurements were made in the fall by the same personnel as in the fall of 1936. After these were completed, the writer visited the home of each child and secured information regarding family food production and preservation, and data regarding the past and present diets and health of the grade-school children. Gum examinations by Miss Bryant and physical measurements were repeated in the spring. Another set of diet records also was secured at that time. Six-hour saturation tests for vitamin C deficiency were made on a small group of children to test the practicability of the method.

1938-39. No physical examinations were made in the fall, owing to the illness of Dr. Higgins. However, dental examinations (teeth by Miss Bryant, gums by Dr. Woods) and physical measurements were made as in previous years. Also six-hour saturation tests were made on a group of 67 children. In the spring gum examinations were repeated by Dr. Woods, who also cooperated with the writer in making some curative tests (with vitamin C) on a group of 23 children with inflamed gums and 3 normal controls. Physical measurements were made as in the fall.

1939-40. Physical examinations (by Dr. Hall), dental examinations (teeth by Miss Bryant, gums by Dr. Woods), and

³ In 1936-37 studies were also continued in Mars Hill. These included observations on physical condition, physical measurements (McCloy, 1936, 1938), and diet records kept by the children at school for one week. All data were secured by the writer. These results will be briefly reported in the present publication.

physical measurements were made in the fall. In the spring gum examinations and physical measurements were repeated and diet records were secured as in the fall of 1936 and the spring of 1938.

PHYSICAL EXAMINATIONS

EXAMINERS

Circumstances prevented the use of the same physician throughout the Newport study. Therefore, each year at the time of the spring measurements, the writer checked the findings made by the physician the previous fall (except in the spring of 1939, when she made independent observations). Since the writer's findings provided directly comparable data for the different years, they were used instead of those of the physicians in summarizing the physical defects.

PROCEDURE FOR EXAMINATIONS

Since physical measurements were made at the time of the physical examinations, the children were asked to urinate before being examined in order to bring their weights to a standard level. All clothes were removed in improvised dressing rooms and one piece examining gowns put on. The outline given in Form 1 (Appendix) was used for the examinations. The key used to describe the conditions found follows Form 1. (See p. 194.)

METHODS OF EXAMINATION

Posture. Posture was noted during both standing and walking and rated according to age.⁴ A child was considered to have good posture if he appeared to be able to habitually hold himself erect, and to have adequately developed and well balanced muscles and well aligned bones.

Nutrition. Nutrition was rated from general appearance rather than specific tests. The usual criteria were used in judging,

⁴ Certain characteristics of posture, such as protruding abdomen and hollow back (lordosis) are normally seen in children below age 6 but are considered as postural defects in older children.

the principal ones being amount of subcutaneous fat, muscular development, color and texture of skin and color of mucous membranes. In most cases the estimates referred to the child's state of nutrition at the time of the examination. However, when he was definitely undersized or showed signs of having had rickets these findings influenced the ratings given by the examiners, even though they were the result of faulty nutrition in the past. The condition of the teeth and gums was not considered in the estimate of nutrition.

Vision. Since vision tests were made each year by the room teachers these tests were not repeated by the physician or nutritionist.

Hearing. Audiometer tests were made each year by the visiting school nurse. The physician's judgment of hearing was based only on observation and questioning.

Ears. Examinations were made with an electric auriscope.

Nasal obstruction. Each nostril was closed in turn to see if the child could breathe through the open nostril.

Mouth. The physician's examination of the mouth was only superficial, since a detailed examination of the teeth and mouth was made by the dental hygienist.

Tonsils. A wooden tongue depressor and electric flash light were used. Note was made on the examination card under "Recommendations" if the physician thought the tonsils should be removed.

Heart and lungs. A stethoscope was used.

Abdomen. The children were examined in the standing position.

Height. The height board consisted of a wooden platform to the back edge of which a board was attached (by 2 adjustable screws). A steel tape measure, graduated in inches, was tacked to the center of this board. In obtaining a child's height he stood on the platform with heels, hips, upper part of back, and head touching the upright board, his hands hanging loosely and his head level. He was not told to "stand tall." The measurement was obtained by the use of a wooden square which was held level, and pressed down firmly on the top of the head. A flange on the right side of the vertical portion of the square fitted over the edge of the height board and helped to keep the square level. Readings were made to the nearest $\frac{1}{8}$ inch.

Weight. The children were weighed in their examining gowns, allowance being made for the weight of the gown. A nurse's portable platform scale (Continental Scale Works, Chicago) was used. The scale was carefully balanced at least twice daily and the weight obtained to the nearest ounce.

Other measurements. For a list of those obtained see p. 115 and Form 1 (Appendix). The techniques used were those of McCloy (1936, 1938).

Breathing capacity. No measurements were made.

Hemoglobin. No determinations were made.

Six-hour vitamin C saturation test. The procedure used for this test was a modification of that used by Harris and Abbasy (1937). It involved having the children save six-hour urine samples and keep diet records on two consecutive days at school.

On the first day the urine was voided at 8:30 A.M. and discarded. All urine voided after that time, up to and including 2:30 P.M., was collected in wide mouthed amber glass liter bottles with rubber stoppers. For a preservative, 20 ml. of glacial acetic acid and 20 gms. of powdered metaphosphoric acid were put into each bottle. Bottles were kept in portable picnic ice boxes between collections and until the urine was titrated later in the afternoon.

On the second day the procedure was the same as on the first day, with the exception that after the urine was voided at 8:30 A.M. 400 mg. of vitamin C was given in tablet form.

In order to determine the amount of vitamin C excreted each day the total volume of urine was measured and 2 to 5 ml. samples titrated⁵ against a standardized solution of purified 2:6 dichlorobenzenoneindophenol (Eastman Kodak Company). For the titration the urine was measured into a 20 ml. beaker and the indicator solution run in until a pink color appeared which persisted 5 seconds. The appearance of this color was determined by comparison with another measured amount of urine. A 5 ml. burette with .02 ml. graduations was used. Merck's Cebione was used in the preparation of the standardized indicator solution.

⁵ The urine was acidified before measuring by mixing 15 ml. with 5 ml. of 20 per cent acid (18 per cent trichloroacetic and 2 per cent metaphosphoric). In recent work this acidification has been found to be unnecessary, since the urine is made sufficiently acid by the acetic and metaphosphoric acids used as preservatives. Preliminary dilution is sometimes necessary when the samples are very high in vitamin C.

TABLE 1

*Summary of Physical Defects Found in Newport and Mars Hill
Grade-School Children*

	Newport				Mars Hill
	Spring 1937	Spring 1938	Spring 1939	Spring 1940	Spring 1937
Numbers in groups	240	231	201	210	230
Bosses on skull	11.7	%	%	%	%
Defect of spine (more than slight)	5.0	11.3	10.0	11.0	4.8
One or more chest defects (more than slight)	23.0	3.9	2.5	2.4	1.3
Pronated feet* (more than slight)	23.0	24.7	16.4	11.4	15.2
Bowlegs	43.3	50.2	45.8	41.4	25.7
Knockknees	9.2	7.8	7.5	4.8	7.8
Fair posture	16.3	18.2	13.4	8.1	10.4
Poor posture	30.0	31.2	22.9	23.8	23.9
Fair nutrition	6.7	6.5	7.0	6.2	6.5
Poor nutrition	21.7	14.7	15.9	18.1	30.9
Obesity	5.4	4.8	3.0	1.0	5.2
Pale skin	.8	3.0	2.5	1.4	3.0
Rough dry skin	5.4	8.7	3.5	4.8	5.2
Acne	23.3	16.5	10.9	13.8	11.7
Pale mucous membranes	3.8	3.9	5.5	3.8	1.7
Strabismus	.8	6.1	0.0	0.0	.4
Eardrum defects†	1.7	3.5	3.0	2.4	.4
Nasal discharge	3.3	2.2	No exam.	5.7	No exam.
Mouth breathing	34.2	22.5	25.9	23.8	39.6
Cough	17.1	11.3	13.4	15.2	16.5
Enlarged or infected tonsils	3.3	6.9	7.5	4.3	6.5
Tonsils removed	23.8	27.7	20.4	21.9	33.9
Enlarged thyroid	21.3	24.2	25.4	24.8	24.3
Failed to gain between fall and spring examinations	4.2	3.5	4.0	3.3	No exam.
Underweight by McCloy standards (more than 6% below standards)	2.6	.9	5.5	2.9	6.8
	30.5	38.4	37.3	36.2	51.5

* See footnote 9, p. 91.

† From previous fall examination by physician.

Vitamin C test for cure of inflamed gums. The children who were used for these tests had received gum examinations by Dr. Woods six days before the tests were begun. The following criteria⁶ were used in rating the degree of inflammation found:

⁶ For a more complete explanation of the criteria used in judging gum inflammation see Crane and Woods (1941, p. 8).

- + Inflammation is limited to the interdental papillae.
- ++ Inflammation extends through the interdental tissues and up into the tissues covering the crest of the alveolar ridge.
- +++ Severe inflammation extends through the interdental papillae and through all the tissues of the alveolus.
- ++++ The severe +++ reaction in the mouth is accompanied by pain in the joints, hemorrhages in the skin, lassitude, and possibly other evidence of scurvy.

In certain cases there was localized inflammation around individual teeth associated with caries, malocclusion, or heavy deposits of calculus. This localized inflammation was not included in the + to 4+ rating but each case was described individually.

Before the tests were begun a visit was made at the home of each child chosen for the test and the mother's permission and promise of cooperation secured. Record sheets, on which were listed the consecutive days of the test, were left with the mothers. The children were asked to take one 100 mg. vitamin C tablet⁷ each day and at the same time to place a check mark on the record sheet opposite the proper day. This gave a record of the number of tablets taken, which could be compared with the number of tablets left in the bottle at the end of the experiment.

The tests lasted 21 days and gum examinations were repeated on the 10th and 21st days.

RESULTS OF PHYSICAL EXAMINATIONS

The results of the spring physical examinations made in Newport in 1937, 1938, 1939, and 1940⁸ and in Mars Hill in 1937 are briefly summarized in Table 1. The results of the examinations made by physicians in Mars Hill, Jonesport, and Monmouth in the spring of 1935 (Clayton, 1940, p. 15) and by the

⁷ The vitamin C tablets for these tests were supplied by the United Drug Company of Boston.

⁸ As previously stated (p. 85), these examinations were made by the nutritionist, who, as far as possible, checked the findings made by the physician the previous fall.

writer in the spring of 1937 are given in Table 2. The results will be discussed in the order in which the headings are given on the examination card (Form 1, Appendix).

TABLE 2

Summary of Physical Defects Found in Grade-School Children in Four Maine Towns

	Mars Hill Spring 1935	Jonesport Spring 1935	Monmouth Spring 1935	Newport Spring 1937
Total number of children examined	205	227	176	240
	%	%	%	%
One or more bone defects	32.2	47.6	37.5	67.5
Bosses on skull	2.9	.9	1.7	11.7
Defect of spine (more than slight)	6.3	5.3	2.8	5.0
One or more chest defects (more than slight)	11.7	13.2	14.8	23.0
Pronated feet* (more than slight)	14.6	37.9	20.4	43.3
Bowlegs	6.3	7.5	7.9	9.2
Knockknees	1.0	.9	.6	16.7
Fair posture	30.2	10.1	15.3	30.0
Poor posture	6.4	4.0	3.4	6.7
Fair nutrition	32.2	21.2	18.8	21.7
Poor nutrition	6.3	1.3	3.4	5.4
Obesity	2.0	.4	2.3	.8
Skin lesions	4.9	12.3	12.5	13.3
Strabismus	4.9	.4	1.7	1.7
Eardrum defects†	8.4	7.3	21.0	3.3
Nasal discharge	3.4	37.9	33.5	34.2
Mouth breathing	18.5	33.5	38.1	17.1
Enlarged or infected tonsils	29.8	24.2	13.1	23.8
Tonsils removed	19.0	11.0	25.0	21.3
Enlarged thyroid gland	1.0	3.9	5.7	4.2
Failed to gain between fall and spring examinations	7.3	5.3	17.0	2.6

* See footnote 9, p. 91.

† From previous fall examination by physician.

Bone development. As will be seen from the tables, bone defects were found very frequently in the Newport children, but the same types of defects were seen in the children from the other towns. The majority of the defects were those which may result from rickets in infancy. These include bosses on the skull, high, narrow chests, flaring ribs, bowlegs, knockknees, and pronated or

flat feet.⁹ In Newport, in the spring of 1940, there was an apparent decrease in the frequency with which these defects occurred in the group as a whole. This improvement is difficult to explain. It may have been due to chance variations in the group, to the prevention of rickets in a greater number of children by the adequate use of vitamin D, calcium and phosphorus during pregnancy and infancy, or to the fact that when general nutrition is good, bone defects resulting from mild rickets may be hidden by the soft tissues and may not be noted in the examination.

Pronated feet occurred almost twice as frequently in the Newport children as in the Mars Hill group (Table 1); but from Table 2 it will be seen that this defect was also very common in the Jonesport children.

It is difficult to explain the high incidence of pronated feet among Maine children. According to Dr. Carl W. Ruhlin,¹⁰ orthopedic surgeon of Bangor, any of the following may be responsible for the condition:

1. Postural changes, as seen in young children. Up until about the age of six most children are knockkneed and show pronation (Sweet, 1938). This results from the effort to maintain body balance. The knockkneed posture causes the child to turn his toes out and to support his weight on the inside of his feet.
2. Postural defects which affect body balance. Too much weight on the inside of the foot causes stretching of the muscles and ligaments and allows the arches to flatten out. Bowlegs and knockknees especially, are often responsible.
3. Nutritional deficiencies, such as insufficient protein or insufficient vitamin D (sometimes also calcium or phosphorus), resulting in rickets. Either type of deficiency may result in pronation by causing weakness of the ligaments in the arches of the feet and weakness of the foot and leg muscles.
4. Muscle imbalance. According to Osgood (1942) this usually results from underdevelopment of the muscles which

⁹ Only a small proportion of the children with pronated feet showed the extreme degree of pronation seen in the condition ordinarily called flat-foot by the medical profession.

¹⁰ Personal communication.

raise the arches of the feet. It may also result from fatigue, poor muscle tone after illness, unreasonably long hours of standing or walking on very hard surfaces, or improper shoes. Extreme muscle imbalance may also result from paralysis.

5. Inherited tendency to flatfoot. This is characterized by unusual flexibility in all of the joints.

Pronation, when due to postural changes, usually disappears during preadolescence when good posture becomes established. Other types may persist.

TABLE 3

Association of Knockknees and Bowlegs with Pronation in Grade-School Children in Newport, Maine

Ages*	Girls									
	6 & 7		8 & 9		10 & 11		12 & 13		14 & 15	
	89		105		108		94		38	
	No.	%	No.	%	No.	%	No.	%	No.	%
Total with pronation	38	42.7	41	39.0	54	50.0	43	45.7	14	36.8
Pronation + knockknees	11	12.4	10	9.5	10	9.3	6	6.4	2	5.3
Pronation + bowlegs	1	1.1	2	1.9	0	0.0	2	2.1	3	7.9

Ages*	Boys									
	6 & 7		8 & 9		10 & 11		12 & 13		14 & 15	
	75		82		108		119		51	
	No.	%	No.	%	No.	%	No.	%	No.	%
Total with pronation	34	45.3	30	36.6	43	39.8	67	56.3	30	58.8
Pronation + knockknees	8	10.7	5	6.1	4	3.7	8	6.7	6	11.8
Pronation + bowlegs	0	0.0	0	0.0	7	6.5	9	7.6	7	13.7

* To nearest birthday.

It is difficult to determine how much of the pronation shown by the Newport children was due to postural changes and how much to other causes. The knockknees associated with postural

changes might be expected to persist in some cases beyond the age of 6 years—possibly to age 8—and to be responsible for the delay in the disappearance of pronation. From age 8 up, however, the occurrence of knockknees can probably be related to rickets. Bowlegs (physiological) are normally seen in infants but should straighten when the child begins to walk (Sweet, Watson, and Strafford, 1928). If this does not occur rickets is usually responsible.

Table 3 indicates the frequency with which pronation, associated with either knockknees or bowlegs, occurred in the Newport children during the four years of this study. It will be seen that in all age groups there were many cases of pronation not accompanied by either knockknees or bowlegs. Knockknees occurred more often than bowlegs and, in the girls, tended to decrease in frequency with increase in age. In the boys there was a decrease through age 11 and then an increase. Bowlegs increased in frequency with age.

Uncorrected pronation in children may become progressively worse in later life and cause considerable pain and disability. Therefore children with this condition should be under the care of a competent physician who may prescribe diet, exercise, corrective shoes, or possibly surgery in extreme cases. Well fitting shoes are a particularly important item in foot health and children with weak feet should not be permitted to wear sneakers, lumberman's rubbers, or other very flat shoes.

Posture. Postural defects were sometimes seen in children who appeared to be well nourished, but occurred most often in those rated as having fair or poor nutrition. Such children often suffer from muscular weakness and fatigue and are therefore unable to maintain good posture. In some cases there were actual deformities of the bones of the chest or back which prevented the child from standing erect. Knockknees or bowlegs were often responsible for poor alignment of the legs and feet.

Table 2 shows that there were more children with good posture in Jonesport and Monmouth than in Mars Hill and Newport. In Newport postural defects were more often seen in the girls than in the boys during all four years, but in Mars Hill there was very little sex difference.

Nutrition. From Table 1 it will be seen that in 1937 there were more children in Mars Hill in fair and poor nutritional condi-

tion than in Newport during any of the four years. Also, it is evident that during the last three years in Newport there were fewer malnourished children than during the first year. Although the percentage of children in Mars Hill who had fair or poor nutrition was quite high in the spring of 1937 (36.1%), there was an improvement over the previous spring when 42.8% of the children were found by the writer to have fair or poor nutrition (Clayton, 1940, p. 15).

A comparison of the percentage of Newport and Mars Hill children who had fair or poor nutrition with the percentage who were underweight by the McCloy standards shows that the percentage who were underweight was higher than the percentage who were judged to have fair or poor nutrition. This was especially true for the girls in both towns. The most plausible explanation for this is that the examiner was more lenient in judging the girls than the boys. This leniency was probably due to the fact that when a large percentage of a group runs below a generally accepted standard the tendency is to lower the standard.

Skin. It will be seen from Table 1 that the percentage of children with pale skin, suggestive of anemia, was not very high in either Newport or Mars Hill, but that in Newport it was highest in the spring of 1938 when the percentage of children with pale mucous membranes was also highest. In both towns the girls showed pale skin much more often than the boys. Tests made in Mars Hill in the spring of 1936 showed 35% of the children to be below 80% in hemoglobin (Clayton, 1940).

The texture of the skin was noted, particularly in order to detect any unusual dryness or evidence of follicular hyperkeratosis, which may occur in vitamin A (or C) deficiency. Table 1 shows that in the spring of 1937 almost one-fourth of the Newport children had rough, dry skin. Many also had some evidence of follicular hyperkeratosis, especially on the arms and legs. However, since the majority had been exposed to severely cold weather during the winter and were suffering from chapping of the skin it was difficult to tell how much of the dryness and roughness had a nutritional cause.

Among the skin lesions noted in Newport (1937-40) and Mars Hill (1937) there were a number of cases of scabies, acne, and cold sores. One Newport child had psoriasis and another ichthyosis. The child with ichthyosis had eaten no butter for four

years, so it is probable that the condition was associated with a vitamin A deficiency. Very few skin lesions definitely suggestive of riboflavin deficiency and none suggestive of niacin deficiency were noted.

Ear drum defects. The ear drum defects noted were perforations and scarring which had resulted from inflammation of the middle ear during colds.

Nasal discharge. It will be noted from Table 1 and 2 that nasal discharge, usually accompanying colds, occurred very frequently in all four towns.

Mouth breathing. Many of the children with mouth breathing had nasal discharge and stated that they had colds. In certain cases permanent mouth breathing was caused by the presence of adenoids; but, since examination (other than noting the presence or absence of obstruction to breathing) was not made, it was impossible to determine the total number of children who had adenoids.

Coughs. The majority of children who had coughs either said they had colds or were just getting over them.

Enlarged or infected tonsils. Defective tonsils were extremely common in all four towns, but were seen a little more frequently in Mars Hill than in the other towns. This defect was least frequent in Monmouth. Children in all towns were very apt to have tonsillar infection or enlargement along with colds in the nose. The lowest percentage of children with tonsils removed was in Jonesport. (See Tables 1 and 2.)

Enlarged thyroid gland. A few cases of simple enlargement of the thyroid were seen in all four towns, the lowest percentage being in Mars Hill and the highest in Monmouth. The percentage for Jonesport (spring 1935) and for Newport (spring 1937-40) was about the same. Newport girls were affected more frequently than boys. Griffith and Mitchell (1934, p. 1066) state that goiter is an expression of iodine starvation and may result from such factors as puberty, infections, intoxications, defective utilization of iodine, or low iodine intake.

Failure to gain between fall and spring examinations. Table 1 shows that in Newport, during three of the four years of this study, there were very few children who failed to gain. The percentage was highest in the spring of 1939 when it almost equaled that for Mars Hill in 1937. In 1939 twenty-five New-

TABLE 4

*Illnesses and Operations Between Fall and Spring Examinations as Reported
by Mars Hill and Newport Grade-School Children*

Numbers in groups	Mars Hill		Newport							
	Spring 1937		Spring 1937		Spring 1938		Spring 1939		Spring 1940	
	230		240		231		201		210	
	No.	%	No.	%	No.	%	No.	%	No.	%
Abcess on face	1	.4	0	0.0	0	0.0	0	0.0	0	0.0
Adenoidectomy	0	0.0	0	0.0	1	.4	0	0.0	0	0.0
Appendectomy	1	.4	2	.8	2	.9	0	0.0	3	1.4
Appendicitis	1	.4	2	.8	1	.4	1	.5	4	1.9
Asthma	1	.4	0	0.0	1	.4	0	0.0	0	0.0
Backache	0	0.0	1	.4	0	0.0	0	0.0	0	0.0
Bronchitis	0	0.0	1	.4	0	0.0	0	0.0	0	0.0
Carbuncles	0	0.0	0	0.0	1	.4	1	.5	0	0.0
Chicken pox	0	0.0	0	0.0	0	0.0	0	0.0	1	.5
Colds	117	50.9	112	46.7	137	59.3	100	52.7	126	60.0
Cough	3	1.3	0	0.0	1	.4	0	0.0	0	0.0
Digestive upset	21	9.1	17	7.1	30	13.0	14	7.0	30	14.3
Eyes	2	.9	1	.4	3	1.3	0	0.0	0	0.0
Eyelds: stys	0	0.0	0	0.0	1	.4	0	0.0	4	1.9
Earache	1	.4	9	3.8	4	1.7	4	2.0	7	3.3
Fatigue	0	0.0	1	.4	0	0.0	0	0.0	0	0.0
Feet, sore	1	.4	0	0.0	0	0.0	0	0.0	0	0.0
Glands, cervical	0	0.0	0	0.0	4	1.7	0	0.0	1	.5
Headache	7	3.0	5	2.1	15	6.5	7	3.5	8	3.8
Heart	1	.4	0	0.0	0	0.0	0	0.0	0	0.0
Influenza	4	1.7	14	5.8	4	1.7	25	12.4	6	2.9
Jaundice	0	0.0	0	0.0	1	.4	0	0.0	0	0.0
Kidneys	1	.4	0	0.0	1	.4	2	1.0	0	0.0
Legache	0	0.0	1	.4	1	.4	0	0.0	0	0.0
Leg weakness	0	0.0	0	0.0	0	0.0	0	0.0	1	.5
Liver	0	0.0	0	0.0	1	.4	0	0.0	0	0.0
Measles	0	0.0	0	0.0	1	.4	0	0.0	41	19.5
Mouth, ulcers	0	0.0	0	0.0	0	0.0	0	0.0	1	.5
Mouth, sore	0	0.0	1	.4	0	0.0	0	0.0	0	0.0
Mumps	0	0.0	0	0.0	1	.4	0	0.0	0	0.0
Neck, stiff	1	.4	0	0.0	0	0.0	0	0.0	0	0.0
Neuralgia	0	0.0	0	0.0	1	.4	0	0.0	0	0.0
Nose bleed	0	0.0	0	0.0	0	0.0	0	0.0	1	.5
Pleurisy	0	0.0	0	0.0	0	0.0	0	0.0	1	.5
Pneumonia	0	0.0	5	2.1	0	0.0	1	.5	1	.5
Rheumatism	0	0.0	0	0.0	0	0.0	0	0.0	1	.5
Rupture	0	0.0	0	0.0	0	0.0	0	0.0	1	.5
Skin (?)	0	0.0	0	0.0	0	0.0	1	.5	0	0.0
Skin: Itch	0	0.0	1	.4	0	0.0	0	0.0	0	0.0
Throat, sore & tonsillitis	4	1.7	9	3.8	12	5.2	8	4.0	8	3.8
Tonsillectomy & adenoidectomy	0	0.0	2	.8	1	.4	0	0.0	0	0.0
Toothache	8	3.5	6	2.5	7	3.0	4	2.0	4	1.9
Whooping cough	0	0.0	0	0.0	0	0.0	2	1.0	1	.5
Worms	0	0.0	0	0.0	1	.4	1	.5	0	0.0

port children had influenza between fall and spring (Table 4). This disease apparently caused a greater weight loss than the epidemic of measles in 1940. The epidemic of German measles at Monmouth in the spring of 1935 was chiefly responsible for the failure of 17% of the children to gain weight.

Underweight by the McCloy standards. Table 1 shows that slightly over one-third of the Newport children and about one-half of the Mars Hill children were underweight according to the McCloy standards. About one-half as many boys as girls were underweight in Newport and two-thirds as many boys as girls in Mars Hill. This large sex difference may possibly be explained as being due to the fact that boys are inclined to eat more than girls; so, when the diet is of poor quality the boys get more of the essential nutrients than the girls.

Illnesses between fall and spring examinations. Table 4 shows that the illnesses most frequently reported by the children were colds, influenza, sore throat and tonsillitis, earache, digestive upsets, headache, and toothache.

Six-hour vitamin C saturation tests. For a discussion of the results of these tests, see p. 130.

Vitamin C tests for cure of inflamed gums. For a discussion of the results of these tests see p. 132.

PHYSICAL MEASUREMENTS

Standing height and weight were two measurements which were made on all of the children studied in the four Maine towns. Therefore, a study of the results of these measurements gives opportunity for the consideration of annual differences in the averages for the Newport and Mars Hill groups and for comparing the averages for each of the four towns with each other and with the U. S. averages of Collins and Clark (1929), the Iowa averages of Meredith (1935) and Boynton (1936), and those of Gray and Ayres (1931). See Charts 1, 2, 3, and 4 and Tables 9, 10, 15, and 16 (Tables in Appendix).

The 30,000 children studied by Collins and Clark were from public schools in various parts of the U. S. and were of native white stock.

The 1243 Iowa City boys studied by Meredith and the 1241 Iowa City girls studied by Boynton were from the schools of the

TABLE 5

Average Heights of Mars Hill, Maine Girls

Fall age†	1934-1935				1935-1936				1936-1937			
	Number		Average		Number		Average		Number		Average	
	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*
			in.	in.			in.	in.			in.	in.
5	5	5	43.4	44.2	5	4	41.0	41.8	3	3	42.4	42.5
6	12	11	44.1	45.2	11	12	45.2	46.3	8	9	45.4	45.9
7	18	18	45.5	46.4	12	11	46.8	48.2	15	14	46.3	47.4
8	17	17	48.1	48.9	19	17	47.7	48.8	15	16	49.1	50.0
9	13	11	51.0	51.6	18	17	50.3	51.2	19	19	50.0	50.9
10	11	11	53.0	53.9	11	11	53.0	54.4	16	16	52.3	53.4
11	18	18	55.1	56.2	15	15	54.8	56.1	18	18	54.2	55.4
12	14	13	56.5	57.5	14	13	57.7	59.0	16	16	58.0	58.9
13	13	13	58.9	59.7	7	6	60.0	61.5	12	12	59.2	60.1
14	5	5	60.7	61.3	5	5	60.0	60.6	9	7	60.6	60.5
15	—	—	—	—	1	1	64.8	65.0	3	2	63.8	64.4

† To nearest birthday.

* Spring and fall age groups kept the same.

TABLE 6

Average Heights of Mars Hill, Maine Boys

Fall age†	1934-1935				1935-1936				1936-1937			
	Number		Average		Number		Average		Number		Average	
	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*
			in.	in.			in.	in.			in.	in.
5	5	5	43.0	44.0	1	1	42.9	43.6	2	2	43.5	44.5
6	9	9	44.7	45.9	12	11	45.4	46.5	6	6	45.1	46.3
7	7	7	47.0	48.0	7	5	46.6	47.9	17	15	47.5	48.6
8	15	13	48.6	49.5	14	13	49.7	51.0	8	8	48.9	50.1
9	9	9	50.5	51.2	12	11	50.8	52.0	14	14	52.1	52.8
10	15	14	53.3	54.2	12	10	52.7	54.2	13	12	52.2	52.9
11	6	6	55.2	55.9	11	11	54.7	55.6	12	12	54.4	55.3
12	8	8	57.1	57.9	6	4	57.9	58.2	15	15	57.2	58.1
13	10	9	59.8	61.3	6	5	59.1	60.8	5	5	57.2	58.0
14	2	2	60.8	61.9	5	4	62.4	64.2	8	4	62.6	64.5
15	1	1	63.8	65.2	1	1	64.6	65.8	5	4	63.9	65.9

† To nearest birthday.

* Spring and fall age groups kept the same.

State University of Iowa. The Iowa groups were described as being "homogeneous as to geographic location, rather superior in cultural and socio-economic status, and not widely diverse as to racial stock."

The boys and girls studied by Gray and Ayres were healthy, white, private school children of superior socio-economic status from various parts of the U. S. The data include 3110 measurements on boys and 1473 on girls. These children showed considerable variability in race ancestry but 46.2 percent of the group were classed as "Old Americans" (four grandparents born in the U. S.).

HEIGHT

ANNUAL DIFFERENCES IN MARS HILL HEIGHT AVERAGES (1934-37)

(Girls and boys) Tables 5 and 6 show that for both girls and boys the fall height averages for each age group were about the same in each of the three years. The averages for spring 1936 tended to be slightly higher than those for the other two years. This was the year when an educational campaign for better nutrition was carried on in Mars Hill under the auspices of the Maine Agricultural Experiment Station (Clayton, 1940, p. 5). However, the differences between the averages for spring 1936 and spring 1935 and 1937 were not statistically significant.¹¹

ANNUAL DIFFERENCES IN NEWPORT HEIGHT AVERAGES (1936-40)

(Girls) Table 7 shows that the fall averages for the girls tended to be slightly higher in 1939 than in the other three years

¹¹ A significant difference is one which would occur, due to chance alone, only 5 times out of 100; a highly significant difference is one which would occur, due to chance alone, only 1 time out of 100. The significance of the average difference between pairs of means (for ages 5 to 15) was expressed as a ratio between the observed average difference and the standard error of this average difference. Significance was determined by reference to a table (Snedecor, 1940, p. 58), with consideration given to the number of degrees of freedom.

TABLE 7
Average Heights of Newport, Maine Girls

Fall age†	1936-1937				1937-1938				1938-1939				1939-1940			
	Number		Average		Number		Average		Number		Average		Number		Average	
	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*
5	7		in.	in.			in.	in.			in.	in.			in.	in.
6	17	6	42.1	43.5	8	8	41.9	43.2	7	4	41.1	43.4	5	4	42.9	43.8
7	10	17	43.8	44.9	13	11	44.4	45.8	14	9	43.8	45.3	13	12	43.5	44.8
8	14	10	46.7	47.4	20	20	46.0	47.2	13	11	46.8	48.5	14	12	45.7	46.8
9	20	12	47.9	48.8	9	9	48.6	49.7	17	16	48.2	49.5	14	13	48.9	49.9
10	19	19	50.9	51.6	14	14	50.8	51.5	11	11	50.7	51.8	17	16	50.4	51.7
11	10	9	52.0	53.1	18	17	52.8	54.5	16	15	53.1	54.5	9	9	52.6	53.6
12	12	12	54.8	55.8	13	13	54.7	55.9	13	11	55.6	57.5	15	15	55.5	56.7
13	19	18	57.5	58.8	11	10	57.2	58.1	15	12	57.9	59.5	12	11	58.4	59.5
14	8	8	60.6	61.5	14	14	59.9	61.1	11	8	59.8	61.5	9	7	60.0	60.4
15	3	3	61.0	61.5	4	4	61.3	61.9	7	6	61.2	61.9	5	4	61.7	61.5
	2	2	61.2	61.5	3	2	62.3	61.8	2	2	61.5	61.6	3	2	61.1	61.0

† To nearest birthday.

* Spring and fall age groups kept the same.

TABLE 8
Average Heights of Newport, Maine Boys

Fall age†	1936-1937				1937-1938				1938-1939				1939-1940			
	Number		Average		Number		Average		Number		Average		Number		Average	
	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*
5	2		in.				in.				in.				in.	
6	14	2	43.5	44.4	1	1	44.0	45.3	6	2	42.8	42.4	7	6	42.9	44.1
7	9	13	44.8	46.1	9	9	45.3	46.2	8	8	45.1	46.5	16	15	45.0	46.0
8	16	9	47.9	48.7	13	13	47.7	49.2	11	8	46.9	48.8	11	11	46.8	48.5
9	17	14	48.8	49.2	9	7	50.1	51.6	15	14	50.2	51.3	10	9	49.3	50.7
10	11	17	51.0	51.8	13	12	50.4	51.3	8	8	52.6	53.8	13	11	52.2	53.9
11	24	11	52.9	53.6	21	20	53.3	54.4	12	11	51.9	53.2	9	9	54.3	55.2
12	17	23	55.3	56.0	8	5	54.4	54.9	17	17	55.1	56.3	13	13	54.3	55.4
13	5	17	56.6	57.4	24	21	57.3	58.7	5	5	56.2	57.5	18	13	57.1	58.1
14	9	5	60.0	61.1	14	14	58.4	59.9	19	18	59.9	61.3	8	7	59.9	61.0
15	2	8	62.4	63.4	5	5	60.3	62.2	5	4	58.4	59.5	9	7	61.7	63.0
		2	66.8	67.5	3	3	63.1	64.8	4	3	63.7	65.1	1	1	61.0	63.3

† To nearest birthday.

* Spring and fall age groups kept the same.

but the differences were not significant. The spring averages were highest in 1939 and lowest in 1937. The differences between the spring averages for these two years were highly significant. The low averages for spring 1937 may possibly be associated

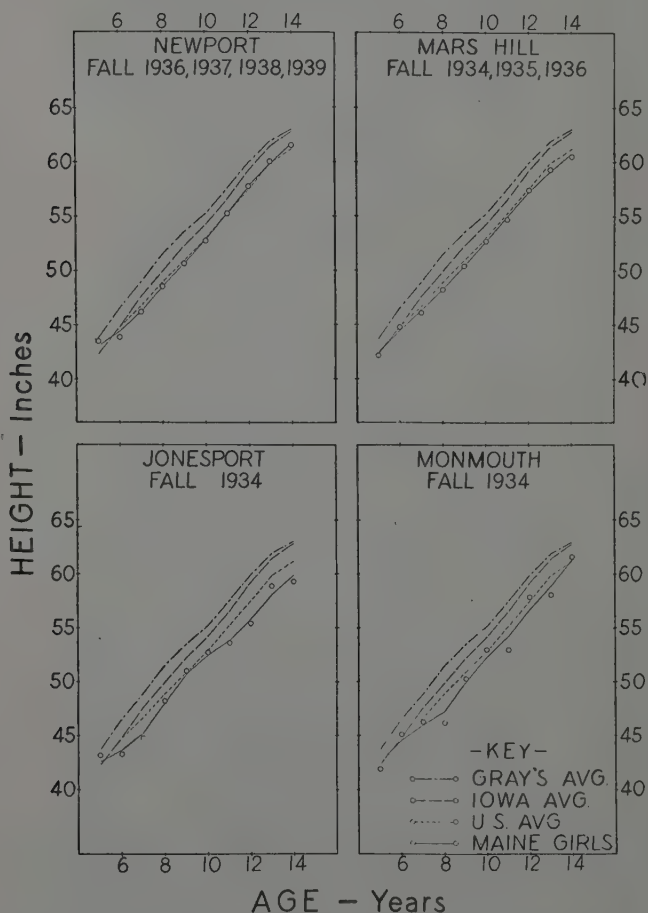


CHART 1. Height of Maine girls. Fall averages for four towns compared with U. S., Iowa, and Gray's averages. (See Table 9, Appendix.)

with the prevalence of unemployment during that year and the resulting inability of many families to secure adequate food.

(Boys) Table 8 shows some differences in the fall as well

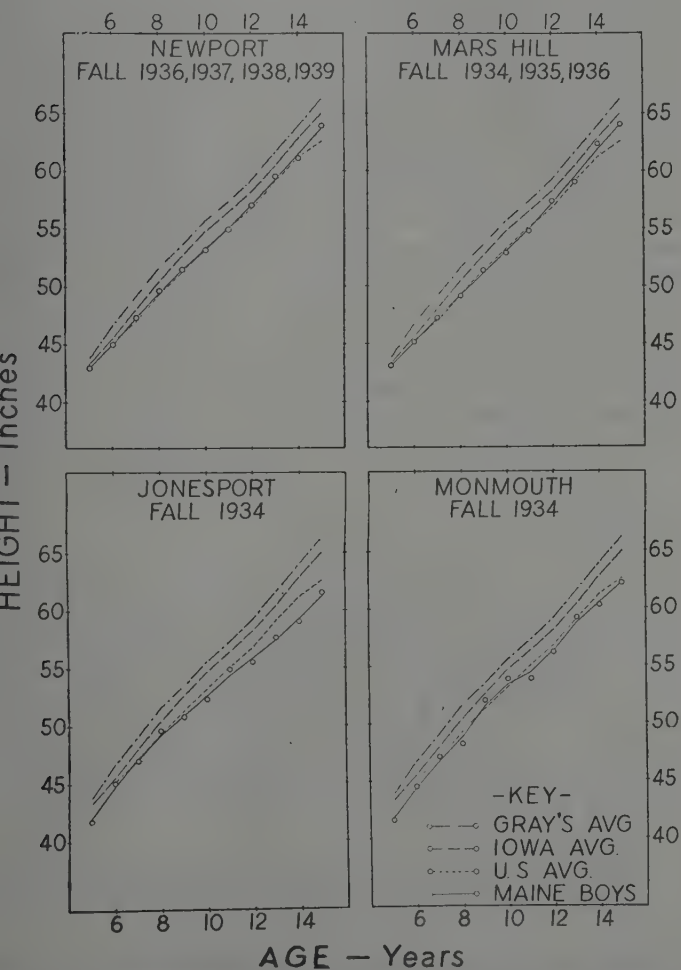


CHART 2. Height of Maine boys. Fall averages for four towns compared with U. S., Iowa, and Gray's averages. (See Table 10, Appendix.)

as the spring averages for the boys in the different years but these differences were not significant.

FALL HEIGHT AVERAGES FOR EACH OF THE FOUR TOWNS
COMPARED WITH EACH OTHER

(Girls) Chart 1 and Table 9 (Appendix) show that the Newport four-year averages for the girls tended to be somewhat higher than those for the other three towns. The differences between the Newport and Jonesport averages were highly significant.

(Boys) As shown in Chart 2 and Table 10 (Appendix), the Newport four-year averages and the Mars Hill three-year averages for the boys were very similar. However, when the Newport and Mars Hill averages were each compared with those for Jonesport and Monmouth the differences had the following statistical significance:

Newport and Jonesport: Newport averages higher. Differences highly significant.

Mars Hill and Jonesport: Mars Hill averages higher. Differences significant.

Newport and Monmouth: Newport averages higher. Differences significant.

Mars Hill and Monmouth: No significant difference.

The highly significant differences in average height of the Newport and Jonesport children may be associated with differences in food supply in the two towns. Jonesport is located on the seacoast, off the main highway, and, especially during the winter months, less food is probably shipped into that town than into Newport. Also fewer Jonesport families have home gardens and the average family incomes are probably somewhat lower and more irregular than those in Newport.

FALL HEIGHT AVERAGES FOR EACH OF THE FOUR TOWNS
COMPARED WITH THE U. S., IOWA, AND GRAY'S AVERAGES

(Girls) See Chart 1 and Table 9 (Appendix). The fall averages for the Newport and Monmouth (except ages 8, 11 and 13) girls were similar to the U. S. averages; those for Mars

Hill and Jonesport, however, were lower and the differences were highly significant. The averages for the girls in each of the four towns were considerably lower than the Iowa City averages of Boynton (1936) and those of Gray and Ayres (1931) for private school girls. Moreover, the differences were highly significant. When the results for the girls in all four towns were averaged together and compared with the U. S., Iowa, and Gray's averages the differences were highly significant.

(Boys) See Chart 2 and Table 10 (Appendix). The fall averages for the Newport, Mars Hill, and Monmouth boys were similar to the U. S. averages. Those for Jonesport, however, were lower and the differences were significant. The averages for the boys in each of the four towns were considerably lower than those of Meredith (1935) for Iowa City boys and those of Gray and Ayres (1931) for private school boys. Again, the differences were highly significant. When the results for the boys in all four towns were averaged together and compared with the U. S., Iowa, and Gray's averages the differences were not significant for the U. S. averages but were highly significant for the other two.

TABLE 11

Average Weights of Mars Hill, Maine Girls

	1934-1935				1935-1936				1936-1937			
	Number		Average		Number		Average		Number		Average	
	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*
			lb.	lb.			lb.	lb.			lb.	lb.
5	5	5	41.5	42.6	5	4	37.1	39.3	3	3	40.1	41.6
3	12	11	42.7	44.9	11	12	43.3	46.7	8	9	45.3	45.8
7	18	18	44.4	46.1	12	11	48.7	51.8	15	14	45.5	47.4
8	17	17	52.2	54.9	19	17	50.2	51.1	15	16	54.2	56.3
9	13	11	56.2	58.7	18	17	58.5	61.2	19	19	54.9	57.9
0	11	11	66.7	69.3	11	11	63.9	67.8	16	16	65.6	67.8
1	18	18	73.0	76.9	15	15	73.3	78.2	18	16	68.1	71.7
2	14	13	78.4	84.2	14	13	84.7	90.2	16	16	86.9	92.1
3	13	13	88.7	93.6	7	6	95.7	102.0	12	12	94.1	97.3
4	5	5	96.8	102.1	5	5	102.2	105.3	9	7	90.3	89.0
5	—	—	—	—	1	1	125.3	126.0	3	2	116.5	119.3

* nearest birthday.

* spring and fall age groups kept the same.

TABLE 12

Average Weights of Mars Hill, Maine Boys

Fall age†	1934-1935				1935-1936				1936-1937			
	Number		Average		Number		Average		Number		Average	
	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*
			lb.	lb.			lb.	lb.			lb.	lb.
5	5	5	39.9	40.9	1	1	42.3	44.0	2	2	40.1	41.3
6	9	9	45.3	47.0	12	11	46.4	47.4	6	6	44.2	46.4
7	7	7	47.0	50.1	7	5	48.8	52.1	17	15	50.1	52.9
8	15	13	51.4	53.8	14	13	53.8	57.2	8	8	52.0	54.4
9	9	9	56.4	58.6	12	11	58.6	60.2	14	14	60.7	61.8
10	15	14	63.3	65.8	11	10	64.4	67.0	13	12	62.2	63.7
11	6	6	66.0	67.8	11	11	66.6	69.7	12	12	67.7	70.4
12	8	8	80.4	83.4	6	4	77.1	76.7	15	15	75.7	78.6
13	10	9	87.3	94.4	6	5	82.1	87.4	5	5	79.7	85.0
14	2	2	90.9	98.0	5	4	94.8	103.2	8	4	97.3	104.5
15	1	1	97.8	103.1	1	1	112.3	122.2	5	4	102.5	111.6

† To nearest birthday.

* Spring and fall age groups kept the same.

Summary for height. The above results would seem to indicate that, in general, the Mars Hill and Jonesport girls and the Jonesport boys measured in this study tended to be somewhat shorter than public school children in other parts of the U. S. The groups measured in all four towns were significantly shorter than the more highly selected groups studied by Meredith and Boynton and Gray and Ayres.

WEIGHT

ANNUAL DIFFERENCES IN MARS HILL WEIGHT AVERAGES
(1934-37)

(Girls) As shown in Table 11 there was a tendency for the average fall and spring weights of the Mars Hill girls to be slightly higher in 1935-36 than in the other two years. However, the differences were not significant.

(Boys) Table 12 shows that in general, the fall as well as the spring averages for the boys were about the same in each of the three years.

TABLE 13

Average Weights of Newport, Maine Girls

Fall age†	1936-1937						1937-1938						1938-1939						1939-1940								
	Number			Average			Number			Average			Number			Average			Number			Average					
	Fall	Spring*	Fall	Spring*	lb.	Fall	Spring*	Fall	Spring*	lb.	Fall	Spring*	Fall	Spring*	lb.	Fall	Spring*	Fall	Spring*	lb.	Fall	Spring*	Fall	Spring*	lb.	Fall	Spring*
5	7	6		37.6	41.0		8	8		39.4	42.0		7	4		35.6	39.1		5	4		39.3	40.1				
6	17	17		40.5	43.5		13	11		40.8	44.5		14	9		41.9	46.9		13	12		39.8	42.0				
7	10	10		46.5	48.5		20	20		44.4	47.1		13	11		46.8	50.5		14	12		45.4	48.0				
8	14	12		49.3	51.9		9	9		49.4	53.3		17	16		48.9	52.3		14	13		50.9	54.5				
9	20	19		58.1	59.9		14	14		55.1	59.4		11	11		54.4	57.5		17	16		55.0	59.4				
10	10	9		59.8	63.4		18	17		59.3	67.9		16	15		63.0	68.3		9	9		59.8	63.1				
11	12	12		73.0	76.7		13	13		68.5	74.9		13	11		72.0	77.3		15	15		71.1	76.4				
12	19	18		79.9	87.9		11	10		79.4	83.7		15	12		82.5	89.4		12	11		83.4	90.0				
13	8	8		91.3	96.1		14	14		92.7	99.2		11	8		93.3	105.5		9	7		95.1	96.2				
14	3	3		101.7	108.9		4	4		98.2	99.2		7	6		98.1	104.7		5	4		107.2	111.1				
15	2	2		91.0	94.2		3	2		103.4	114.1		2	2		99.3	106.7		3	2		95.6	100.4				

† To nearest birthday

* Spring and fall age groups kept the same.

TABLE 14
Average Weights of Newport, Maine Boys

Fall age†	1936-1937				1937-1938				1938-1939				1939-1940			
	Number		Average		Number		Average		Number		Average		Number		Average	
	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*	Fall	Spring*
5	2	2	lb.	lb.	1	1	41.3	45.5	6	2	40.9	39.3	7	6	40.4	42.5
6	14	13	33.2	42.8	10	9	45.7	46.3	8	8	43.2	45.7	16	15	45.3	47.5
7	9	9	44.2	47.2	15	13	50.5	53.5	11	8	49.7	53.4	11	11	48.6	51.8
8	16	14	51.1	52.3	9	7	57.3	61.9	15	14	56.3	59.9	10	9	55.5	58.5
9	17	17	57.5	68.1	13	12	54.9	58.7	8	8	63.5	67.7	13	11	62.4	67.8
10	11	11	65.3	68.3	21	20	65.9	68.3	12	11	60.6	64.0	9	9	68.8	73.3
11	24	23	70.9	74.3	8	5	68.5	73.0	17	17	71.7	75.1	13	13	67.0	71.0
12	17	17	77.4	80.2	24	21	78.2	85.8	5	5	76.8	82.4	18	18	78.3	83.6
13	5	5	90.2	97.2	14	14	83.1	88.7	19	18	91.4	99.0	8	7	92.6	98.6
14	9	8	98.0	104.1	5	5	93.0	102.0	5	4	83.4	87.9	9	7	104.6	112.4
15	2	2	121.9	127.0	3	3	93.8	105.8	4	3	104.5	115.5	1	1	101.2	105.1

† To nearest birthday.

* Spring and fall age groups kept the same.

ANNUAL DIFFERENCES IN NEWPORT WEIGHT AVERAGES (1936-40)

(Girls) A comparison of the average fall weights for the girls in the different years shows that, except for fall 1939, the averages for the different years were quite similar. Those for fall 1939 tended especially to be higher than those for fall 1937. (See Table 13.) Moreover, the differences were significant. The spring averages in the different years showed no significant differences, but the averages for spring 1939 tended to be slightly higher than those for the other years.

(Boys) From Table 14 it will be seen that there was some tendency for the average weights of the boys to be lower in fall 1938 and higher in fall 1939 than in the other years. However, the differences between the fall averages were not significant. There were also no significant differences between the spring averages, although those for spring 1940 tended to be slightly higher than those for the other years.

FALL WEIGHT AVERAGES FOR EACH OF THE FOUR TOWNS COMPARED WITH EACH OTHER

(Girls) As shown in Chart 3 and Table 15 (Appendix), the four-year weight averages for the Newport girls were about the same as the three-year averages for Mars Hill, slightly higher than those for Jonesport, and slightly lower than those for Monmouth. However, the differences between the Newport averages and those for the other three towns were not significant. The averages for the Mars Hill and Monmouth girls were significantly higher than those for the Jonesport girls.

(Boys) Chart 4 and Table 16 (Appendix) show that the four-year weight averages for the Newport boys were about the same as those for the Monmouth boys and somewhat higher than those for Jonesport and Mars Hill. However, only the differences between the Newport and Mars Hill averages were significant. The differences between the Mars Hill, Jonesport, and Monmouth averages were not significant.

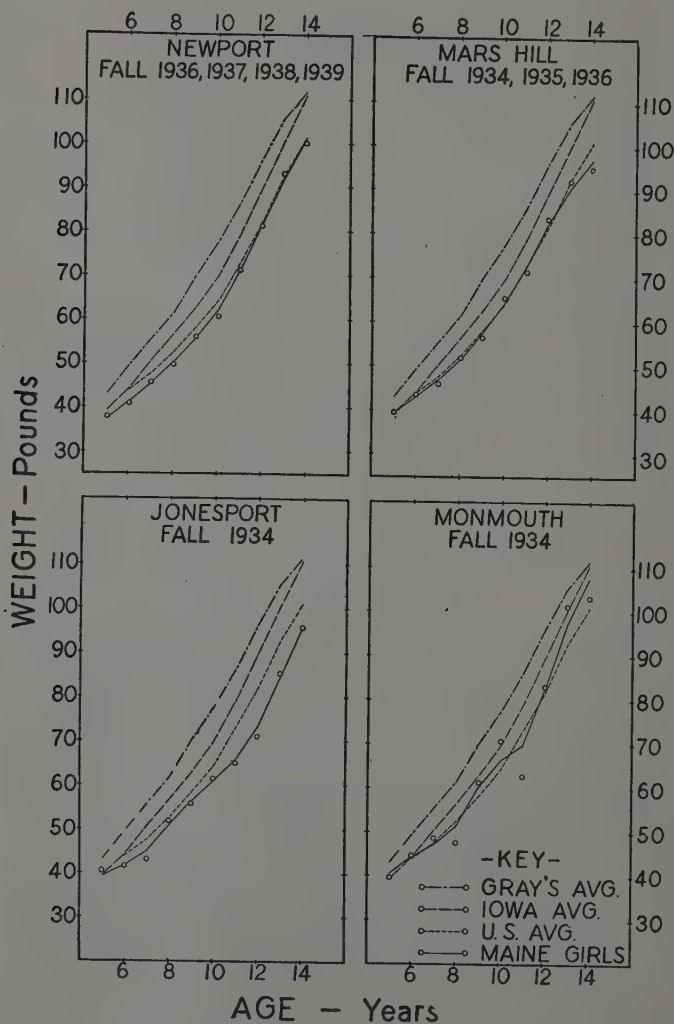


CHART 3. Weight of Maine girls. Fall averages for four towns compared with U. S., Iowa, and Gray's averages. (See Table 15, Appendix.)

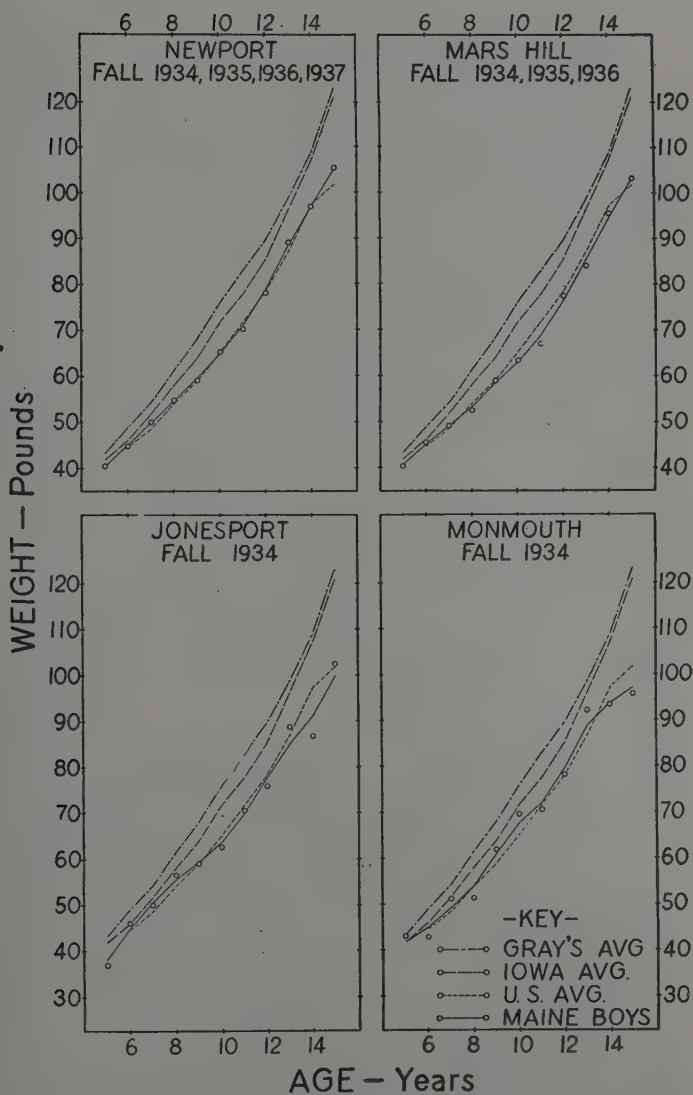


CHART 4. Weight of Maine boys. Fall averages for four towns compared with U. S., Iowa, and Gray's averages. (See Table 16, Appendix.)

FALL WEIGHT AVERAGES FOR EACH OF THE FOUR TOWNS
COMPARED WITH THE U. S., IOWA, AND GRAY'S AVERAGES

(Girls) See Chart 3 and Table 15 (Appendix). The fall averages for the Mars Hill and Monmouth girls were very similar to the U. S. averages; those for Newport and Jonesport, however, were lower and the differences were highly significant. The averages for the girls in each of the four towns were considerably lower than the Iowa and Gray's averages and the differences were highly significant. When the results for the girls in all four towns were averaged together and compared with the U. S., Iowa, and Gray's averages the differences between the Maine and U. S. averages were significant. In comparison with the Iowa and Gray's averages the differences were highly significant.

(Boys) See Chart 4 and Table 16 (Appendix). The fall averages for the boys in each of the four towns showed no significant differences from the U. S. averages. In comparison with the Iowa and Gray's averages, however, those for Maine boys were considerably lower. The differences were highly significant (except in the comparison between the Monmouth and Iowa averages; in this case the differences were significant). When the results for the boys in all four towns were averaged together and compared with the U. S., Iowa, and Gray's averages the differences showed no significance in the case of the U. S. averages but high significance for the Iowa and Gray's.

Summary for weight. The above results can be summarized briefly as follows: The Newport and Jonesport girls measured in this study tended to weigh less than public school girls in other parts of the U. S. (Collins and Clark, 1929). The average weights of the boys in all four Maine towns were about the same as the U. S. averages. In comparison with the Iowa City averages of Meredith (1935) and Boynton (1936) and the averages of Gray and Ayres (1931) for private school children, the average weights of the Maine girls and boys in this study were significantly low.

TYPE OF BUILD

In Newport (1936-40) and in Mars Hill (1936-37) the necessary measurements were taken for determining normal weight by the McCloy method and the McCloy weight, fat, and limb girth

indices (McCloy 1936, 1938). See p. 115 and Form 1, Appendix. Therefore these individual measurements were available for comparison with those of other groups of children.

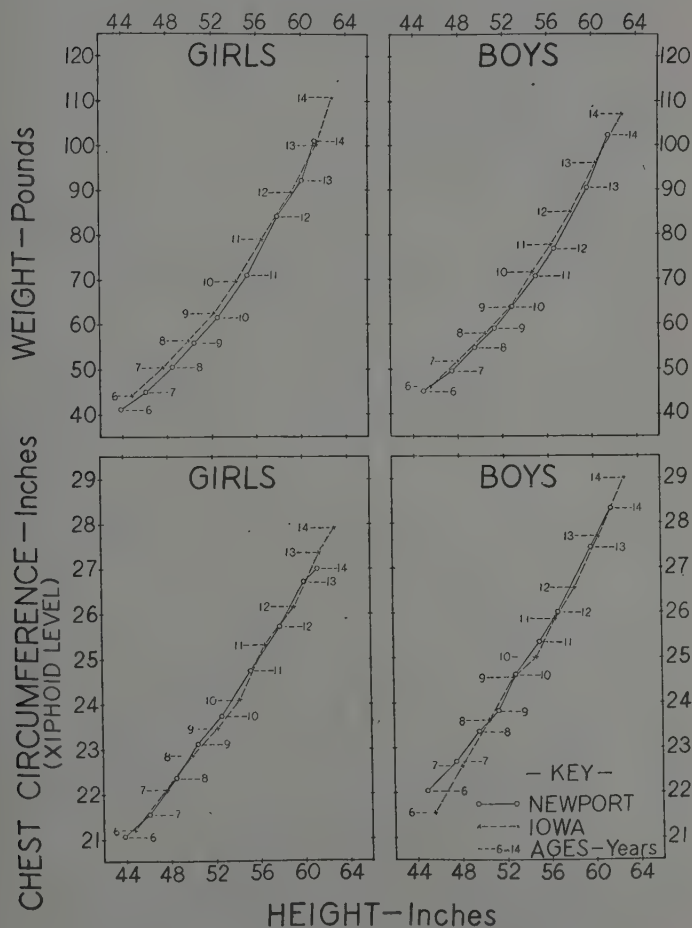


CHART 5. Comparison of Newport, Maine, children with Iowa City children. Height for weight and height for chest circumference (xiphoid level). (See Table 17, Appendix.)

As a method for studying the average type of build of the Newport children their average height for age and sex was considered in relationship to average weight, average chest circumference (xiphoid level), and average bi-iliac hip width. In Charts 5 and 6 curves are given which make it possible to compare the average build of the Newport children with that of the Iowa City children studied by Meredith (1935) and Boynton (1936). Since two sets of measurements were made on the Newport group each year, those measurements were used (in this study of build) which fell nearest to the child's birthday.

Height for weight. From Chart 5¹² it will be seen that if age is not considered, the average weight for a given height of the Newport children is not far below that of the Iowa children. However, when age also is considered the Newport children are found to be retarded, as much as one year in some age groups.

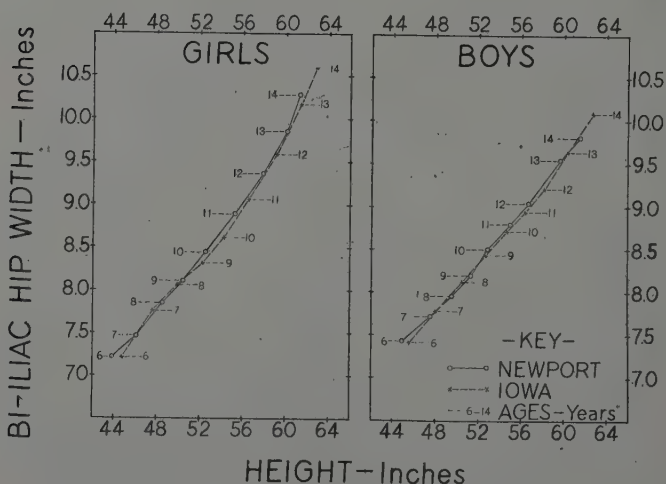


CHART 6. Comparison of Newport, Maine, children with Iowa City children. Height for bi-iliac hip width. (See Table 17, Appendix.)

¹² The Newport averages for height, weight, chest circumference (xiphoid level), and bi-iliac hip width used in charts 5 and 6 are given in Table 17 (Appendix).

Height for chest circumference (xiphoid level). Chart 5¹² shows that the Newport and Iowa curves of height for chest circumference are practically superimposed, except in the two lower age groups of the boys. This indicates that the Maine and Iowa children are proportioned about the same. A study of the size-for-age relationship shows, however, that the Newport children are both shorter in stature and smaller in chest circumference for their age than the Iowa children.

Height for bi-iliac hip width. Chart 6¹² shows again that the Newport children are proportioned about the same as the Iowa City children. When age is considered, however, the Newport children are both shorter in stature and narrower in the hips than the Iowa City children.

The question arises as to what the causes may be for this difference in size for age of the Newport and Iowa City children. Some of the difference may be due to inheritance but it is also probable that many of the diets of the Newport children were deficient in one or more of the necessary growth factors. Among these may be mentioned the following: high quality protein, calcium (together with phosphorus and vitamin D), vitamin A, thiamin, riboflavin, niacin, and vitamin C.

EVALUATION OF THE McCLOY METHOD FOR DETERMINING NORMAL WEIGHT AND THE McCLOY WEIGHT, FAT, AND LIMB GIRTH INDICES

The measurements taken for determining normal weight by the McCloy method and the McCloy (1936, 1938) weight, fat, and limb girth indices¹³ included the following: standing height, weight, chest circumference (xiphoid level), girth of upper arm, girth of forearm, girth of thigh, girth of calf, bi-iliac hip width, elbow width, knee width, fat-chest front, fat-abdomen, fat-chest back, and fat-supra-iliac.

¹³ The formulas for these indices are as follows:

$$\text{Weight index: } \frac{\text{Actual weight}}{\text{Normal weight}} \times 100$$

$$\text{Fat index: } \frac{\text{Actual fat}}{\text{Normal fat}} \times 100 \text{ or } \frac{\text{Actual fat minus normal fat}}{\text{Normal minus minimum}} \times 100$$

$$\text{Limb girth index: } \frac{\text{Actual limb girth}}{\text{Normal limb girth}} \times 100$$

Relationship between the McCloy indices and the writer's estimates of nutrition. The results of the above measurements, made on the Newport children, were used by the writer (Clayton, 1942) to study the relationship between the McCloy weight, fat, and limb girth indices and her own estimates of nutrition. High correlations were obtained between the weight and fat indices and the nutrition estimates but the correlation between the limb girth indices and the estimates of nutrition was low.

Adequacy of the McCloy weight standards for individual children. In the same study an attempt was made to evaluate the McCloy weight standards for individual children of varying skeletal builds and varying states of nutrition. For children having other than average skeletal builds the McCloy standards seemed to be much more adequate than the Baldwin-Wood, which are based on age and height only. The McCloy standards appeared to be somewhat high, however, for overweight subjects and somewhat low for those who were extremely underweight. The conclusion was reached that, in spite of these inadequacies, the McCloy standards for normal weight are apparently more reliable than any others available at present. However, since it is necessary to take 8 (9, including actual weight) physical measurements in order to determine a child's normal weight by this method, the time and labor involved in taking the measurements and in making the necessary calculations must be considered in any plan for using the method.

Value of the McCloy weight and fat indices in judging nutritional status. These indices provide information which can be used to determine not only whether a child weighs the correct amount for his skeletal build but also whether or not he has a normal distribution of muscle and fat.

*Use of normal weight to determine build type.*⁸ As suggested by McCloy (1938, p. 13) a child's normal weight, determined by the McCloy method, may be used to determine his type of body build by the use of the following formula:

$$\sqrt[3]{\frac{\text{Normal wt. in kg.} \times 100}{\text{Ht. in cm.}}}$$

This so-called "ponderal index" was used to study the body build of the group of 24 Newport boys who were 11 years old (nearest birthday) at the time of the 1936 fall examination. The

average index for the group was 2.27 with a standard deviation of ± 0.05 . This average is the same as the one given by McCloy for Iowa boys of this age. This again indicates that, in general, the Newport and Iowa boys, aged 11 years, have skeletal builds which are proportioned about the same. However, a comparison of the average height, chest circumference (xiphoid level), and the bi-iliac hip width of this 11-year-old group of Newport boys with the Iowa averages for boys of the same age given by Boynton (1936, pp. 83 and 84), shows that the Newport boys are somewhat smaller for their age:

Boys Age 11	Av. height inches	Stand. dev.	Av. bi-iliac hip width		Av. chest cir. (xiphoid level)	
			inches	Stand. dev.	inches	Stand. dev.
Iowa	56.4	± 2.40	8.94	$\pm .54$	25.86	± 1.56
Newport	55.3	± 1.91	8.74	$\pm .37$	25.10	± 1.01

Use of normal weight to determine developmental progress.
 Since a child's developmental progress is even more important than his weight for skeletal build at any particular time, a curve showing his height and calculated (by the McCloy method) normal weight at successive ages could be compared with a height-weight curve for well-nourished children, such as the one given in Chart 5 for Iowa City children. Since normal weight, as determined by the McCloy method, is based on skeletal build this comparison would give an indication of his progress in skeletal development.

PHYSICAL CHANGES DURING ADOLESCENCE

Since the Newport children were examined in four successive years, it has been possible to study the physical changes which took place in a group of 12 girls and 7 boys during the period of adolescence. These changes have been summarized in Tables 18 and 19. All of the girls who were 9 and all of the boys who were 11 years old at the beginning of the study were included. The stage of pubescence which had apparently been reached at the time of each fall physical examination has been indicated in the Tables as follows: 0 (no development) to 3+ (mature).

TABLE 18
Physical Changes in Newport Girls during Adolescence

Fall 1936			Fall 1937			Fall 1938			Fall 1939							
Ages			9			10			11			12				
Case No.	Ht.	Bi-iliac hip width	Wt.* index	Pon-deralt index	Stage of pubes- cence	Ht. in- crease from age 9	Hip width in- crease from age 9	Wt.* index	Pon- deralt index	Stage of pubes- cence	Ht. in- crease from age 9	Hip width in- crease from age 9	Wt.* index	Pon- deralt index	Stage of pubes- cence	
1	46.8	7.36	100	2.36	0	3.5	5.9	94	2.38	0	7.5	9.6	96	2.36	0 to +	+
2	49.4	7.72	90	2.30	0	3.3	4.1	86	2.32	0	8.3	9.7	86	2.29	0	0
3	50.0	8.07	101	2.36	0	5.0	10.2	90	2.43	+	12.0	18.0	100	2.38	2+	0
4	50.8	8.07	92	2.32	0	3.7	6.3	89	2.34	0	9.1	11.7	87	2.31	0 to +	3+
5	51.5	8.39	110	2.34	0	5.6	6.6	96	2.35	0	11.9	12.2	100	2.29	0 to +	3+
6	51.9	8.50	108	2.35	0	4.8	5.6	102	2.39	0 to +	10.4	12.5	105	2.40	2+	2+
7	51.9	8.27	105	2.30	0	6.0	5.2	97	2.34	+	12.0	14.8	101	2.30	2+	2+
8	52.0	8.27	99	2.28	0	4.3	5.7	89	2.30	0	10.8	12.9	102	2.27	+	3+
9	52.0	7.83	94	2.45	0	1.0	8.5	100	2.45	0	5.3	13.6	100	2.45	0	0 to +
10	52.9	8.78	82	2.34	0	3.8	4.9	82	2.34	0	7.8	8.1	77	2.35	0	0 to +
11	53.0	8.90	107	2.29	0	4.0	4.4	98	2.36	0	7.5	9.3	104	2.32	+	+
12	54.3	8.39	106	2.15	0	3.0	6.1	95	2.24	0	6.2	8.5	98	2.23	0	+
Av.	51.4	8.21	100	2.32		4.0	6.1	94	2.35		9.1	11.7	96	2.33		0
											</					

* Actual weight x 100
Normal weight (McClary 1936, 1938)

An index below 94 indicates underweight.

An index of 108 or above indicates overweight.

† $\frac{\text{Normal weight (McClary)} \times 100}{\text{in kg}}$

Ht. in cm.

This is an index of type of skeletal build.
A 1 indicates a slender type, a high index a stocky type.

TABLE 19
Physical Changes in Newport Boys during Adolescence

Ages	Fall 1936				Fall 1937				Fall 1938				Fall 1939			
	11				12				13				14			
	Ht.	Bi-iliac hip width	Wt.* index	Pon-deralt index	Stage of pubescence	Ht. increase from age 11	Hip width increase from age 11	Wt.* index	Pon-deralt index	Stage of pubescence	Ht. increase from age 11	Hip width increase from age 11	Wt.* index	Pon-deralt index	Stage of pubescence	
Case No.	in.	in.			%	%					%	%				
1	52.3	7.99	101	2.31	0	2.4	4.9	99	2.33	0	4.8	7.4	101	2.31	0	
2	53.0	8.27	101	2.29	0	3.3	6.7	96	2.33	0	7.5	11.9	100	2.33	0	
3	53.3	8.78	103	2.39	0	4.7	4.5	100	2.39	0	9.6	10.3	101	2.39	2+	
4	54.0	8.94	106	2.31	0	2.8	—	104	2.40	0	7.9	11.5	105	2.41	+	
5	54.8	8.19	90	2.31	0	2.7	4.3	92	2.29	0	5.9	7.2	94	2.28	0	
6	55.8	9.29	101	2.29	0	3.4	4.7	95	2.33	0	8.5	8.9	96	2.30	+	
7	57.9	8.78	100	2.24	0	8.0	8.1	93	2.29	+	14.3	14.8	101	2.26	3+	
Av.	54.4	8.61	100	2.31		3.9	4.6	97	2.34		8.4	10.3	100	2.33		

* Actual weight x 100

Normal weight (McCloy 1936, 1938)

An index below 94 indicates underweight.

An index of 108 or above indicates overweight.

† Normal weight (McCloy) x 100

in kg

Ht. in cm.

See McCloy, 1938, p. 13.

This is an index of type of skeletal build.

A low index indicates a slender type, a high

index a stocky type.

The rating of stage of pubescence was based on the following physical changes (Adapted from McCloy, 1938, p. 90):

GIRLS	Boys
+ Beginning pubescence. Slight development of breasts. A few pigmented pubic hairs.	+ Beginnig pubescence. Beginning acceleration in development of genitalia. A few pigmented pubic hairs.
++ Intermediate stage in development of breasts and growth of pigmented pubic hair.	++ Intermediate stage in development of genitalia and growth of pigmented pubic hair.
+++ Probable sexual maturity. Breasts developed. Menstruation has begun. Full growth of pigmented pubic hair.	+++ Probable sexual maturity. Genitalia developed. Full growth of pigmented pubic hair.

Girls. As shown in Table 18, only 3 of the 12 girls in the group showed signs of beginning pubescence at age 10. At age 12 three were mature, 2 did not even show signs of beginning pubescence, and the other 7 were in intermediate stages. The attainment of maturity was accomplished by a gain in height of about 16 per cent from age 9. The percentage increase in hip width from age 9 did not appear to be related to the attainment of maturity.

Boys. As shown in Table 19, there was 1 boy in the group of 7 who was unusually far advanced in physical development for his age. He was the tallest of the group and showed evidence of beginning pubescence at age 12. At age 13 he showed signs of maturity and had gained 14.3 per cent in height from age 11. During the next year he gained 18.1 per cent (from age 11). The 4 boys who matured during the period of this study were among the tallest in the group (See McCloy, 1938, p. 91) and attainment of maturity was accompanied by an increase in height of about 16 per cent from age 11. The percentage increase in hip width did not appear to be related to the attainment of maturity.

DENTAL EXAMINATIONS

As was previously stated, Miss Dorothy Bryant, D.H., Associate Director, Division of Dental Health, State Department of Health and Welfare, made all of the examinations of the teeth in

the Newport study. The examinations were made in the fall of each year. Miss Bryant also made the gum examinations in the fall of 1936, fall of 1937 and spring of 1938. Beginning with the fall of 1938 gum examinations were made, both fall and spring, by Dr. Philip W. Woods, Director, Division of Dental Health, State Department of Health and Welfare. Dr. Woods also examined the gums of special groups of children in connection with six-hour saturation tests for vitamin C deficiency and vitamin C tests for the cure of inflamed gums.

METHOD OF EXAMINATION

Form 2 (Appendix) was used for recording the Newport examinations. No prophylaxis preceded them, since facilities did not permit. The child was seated facing the light and each of the five tooth surfaces was searched carefully with S.S. White explorers (No. 3 double end and No. 5) together with plain mirrors. All sound teeth present in the mouth were indicated on the card by check marks. Those having defects were described individually by the use of the symbols given in Form 2. When necessary, notes were made regarding special conditions found. Missing teeth were not recorded specifically as such, but teeth known to have been extracted were so indicated.

Cavities were classified as follows and the involved tooth surfaces indicated on the cards:

1. Superficial. Cavities in which the caries penetrated the enamel surface but not beyond. The following were included under superficial cavities but were recorded separately.

Decalcified areas. White areas of decalcification following the gingival margin on the buccal or lingual surface. Such an area was recorded if present, whether or not the explorer penetrated the enamel.

Fissures (and pits). Slight defects in the enamel surface in which the explorer caught. Such defects are considered precarious or predisposed to caries.

2. Deep. Cavities in which the caries involved the dentine only or both dentine and pulp. The following were included under deep cavities but were recorded separately:

Retarded caries. A condition seen in teeth in which decay has progressed into the dentine, where it is halted by some metabolic process. The exposed surface of dentine becomes hard and appears dark in color.

Retained roots. Remains of teeth in which the crowns have been destroyed by caries as far as the gum line.

Fillings were classified only as deciduous or permanent according to their location. However, the tooth surfaces involved were indicated on the cards.

RESULTS OF DENTAL EXAMINATIONS

A summary of the results of the Newport examinations is given in Table 20. In this table cavities in both the deciduous and permanent teeth are classified only as superficial and deep and are calculated as an average per mouth examined. In Table 21 the fall 1936 results for Newport are compared with the fall 1934 results for the other three towns. In this table decalcified areas and fissures are indicated separately so that comparisons may be made with results of other surveys in which these defects were not included as superficial cavities. The omission of these in the present study would reduce especially the figures for total cavities in the permanent teeth.

Following is an explanation of the terms used in summarizing the results:

"Combined total cavities" is an average per mouth examined, including both deciduous and permanent teeth.

"Combined total fillings" is an average per mouth examined, including both deciduous and permanent teeth.

"Affected teeth" are calculated as an average per mouth examined of all teeth present which have been affected by caries, whether active or corrected. Retained roots are included.

"Extracted permanent teeth carious" is an average per mouth examined. Only extractions of carious permanent teeth are included, since it was difficult to distinguish between exfoliated and extracted deciduous teeth.

"No caries" is recorded as the percentage of children with no caries, fillings, or extractions.

TABLE 20
 Summary of Newport Dental Examinations

Year	No. in group	Av. no. cavities deciduous teeth			Av. no. cavities permanent teeth			Av. no. comb. total cavities	Av. no. fillings			Av. no. affected teeth†	Av. no. deciduous teeth abscessed	Av. no. permanent teeth abscessed	Av. no. extracted permanent teeth carious	No caries enamel	Mal-occlusion	Hypo-plastic enamel	Inflamed gums	
		S*	D	Total	S*	D	Total		Decid-uous	Perma-nent	Comb. total								%	%
1936-37	Girls 116	7	4.3	4.9	2.1	2.3	4.4	9.3	.60	1.07	1.67	7.8	.22	.02	.18	3.5	37.9	2.6	8.6	—
	Boys 126	9	4.3	5.1	2.3	2.8	5.1	10.2	.06	1.13	1.19	7.9	.19	.07	.16	3.2	46.8	3.2	13.5	—
	Total 242	8	4.3	5.0	2.2	2.6	4.8	9.8	.32	1.10	1.42	7.9	.20	.05	.17	3.3	42.6	2.9	11.2	—
1937-38	Girls 124	8	4.1	4.8	1.9	2.2	4.2	9.0	.55	1.19	1.73	7.5	.27	.02	.23	2.4	29.0	.8	7.3	29.4
	Boys 119	5	4.1	4.6	1.7	3.0	4.7	9.3	.23	1.32	1.55	7.7	.12	.07	.19	3.4	40.3	4.2	6.7	37.4
	Total 243	7	4.1	4.7	1.8	2.6	4.4	9.1	.39	1.25	1.64	7.6	.20	.04	.21	2.9	34.6	2.5	7.0	33.3
1938-39	Girls 133	1.0	3.8	4.8	2.5	2.5	5.0	9.8	.65	1.47	2.12	8.0	.21	.02	.18	1.5	—	3.0	17.3	21.2
	Boys 118	1.0	4.7	5.6	2.1	3.4	5.5	11.1	.30	1.33	1.63	8.4	.15	.04	.20	3.4	—	1.7	17.8	23.9
	Total 251	1.0	4.2	5.2	2.3	2.9	5.2	10.4	.49	1.40	1.89	8.2	.18	.03	.19	2.4	—	2.4	17.5	21.0
1939-40	Girls 125	3	4.4	4.8	.9	3.7	4.7	9.4	.53	1.54	2.06	7.9	.21	.01	.12	6.4	—	2.6	8.8	15.7
	Boys 117	3	5.4	5.7	1.1	3.5	4.6	10.3	.40	1.19	1.59	7.9	.13	.01	.23	5.1	—	3.4	12.8	22.4
	Total 242	3	4.9	5.2	1.0	3.6	4.6	9.8	.47	1.37	1.83	7.9	.17	.01	.17	5.8	—	3.0	10.7	18.9
4 years	Total 978	7	4.4	5.0	1.9	2.9	4.8	9.8	.42	1.28	1.70	7.9	.19	.03	.19	3.6	2 yrs. 38.6	2.7	11.7	24.4

† Including retained roots.

* Decidified areas and fissures included.

Key to abbreviations: S—Superficial

D—Deep

TABLE 21
*Summary of Fall Dental Examinations Made in Four Maine Towns**

Town	Year	No. in group	Average no. cavities deciduous teeth						Average no. cavities permanent teeth						Av. no. combined total cavities	Average no. fillings			Av. no. affected teeth†	Av. no. extracted permanent teeth	No caries occlusion	Hypo-plastic enamel	In-flamed gums
			DA			FS			DA			FS				Decid-uous	Perma-nent	Comb. total					
			DA		S	FS		D	DA		S	D	Total										
			DA	FS	S	D	Total	DA	FS	S	D	Total											
Newport	1936	242	.0	.1	.7	4.3	5.0	.1	1.3	.8	2.6	.32	1.10	1.42	7.9	.17	3.3	42.6	2.9	11.2			
Mars Hill	1934	202	.0	.3	.3	5.2	5.7	.0	2.3	.0	4.5	.03	.24	.25	10.5	.26	.5	38.1	3.5	3.5			
Jonesport	1934	238	.0	.1	.2	4.8	5.1	.0	2.3	.1	3.0	.16	.76	.91	8.9	.30	1.8	39.8	1.7	3.4			
Monmouth	1934	199	.0	.2	.0	4.9	5.2	.0	2.7	.0	5.0	.05	.79	.83	10.5	.27	1.5	37.7	3.9	1.0			

* See Clayton, 1940, pp. 80-81.

Key to abbreviations: DA—Decalcified areas

FS—Fissures and pits

S—Superficial

D—Deep

† Including retained roots

"Malocclusion" is calculated as the percentage of children with any of the types of malocclusion listed in Form 2. Overbite was included under upper protrusion.

"Inflamed gums" are recorded as the percentage of children with any type of gum inflammation.

"Abscessed" deciduous or permanent teeth are an average per mouth examined of visible fistulas resulting from the specific teeth involved.

"Hypoplastic enamel" is calculated as the percentage of children with visible formative enamel defects in either the deciduous or permanent teeth. These defects consist of pits or grooves which run parallel to the gum line.

Comments on the data given in Tables 20 and 21 will be made according to the table headings.

Cavities, deciduous. The average number of cavities in the deciduous teeth of the Newport children (for the four years) was 5 and the variation from year to year was slight. Eighty-eight per cent of these were deep cavities and 3.8 per cent had become abscessed, producing visible fistulas. The fall 1936 total average for Newport was slightly lower than that for Mars Hill but similar to those for Jonesport and Monmouth.

Cavities, permanent. The total average number of cavities in the permanent teeth of the Newport children (for the four years) was 4.8 and 60.4 per cent of these were deep cavities. The average for fall 1938 was slightly higher than those for the other three years. The Newport total average for fall 1936 was somewhat lower than those for the other three towns in 1934 but the differences may have been partly due to differences in standards used by the different examiners.

Combined total cavities. The average number of combined total cavities in the teeth of the Newport children for the four years was 9.8, the average for fall 1938 being slightly higher than those for the other three years. The fall 1936 average for Newport was lower than those for the other three towns in 1934. Again, the differences may have been partly due to the difference in examiners.

Fillings, deciduous. Very few fillings were found in the deciduous teeth, the four-year average for Newport being only .42. However, even the low fall 1936 average for Newport was higher than the 1934 average for the other three towns. This almost complete absence of fillings in the deciduous teeth is apparently the

result of the failure of most parents to realize the importance of preserving these teeth until they are naturally exfoliated. Only in this way can the children's mouths be kept healthy and the developmental spaces held for the permanent teeth.

Fillings, permanent. The average number of fillings in the permanent teeth of the Newport children was also very low in comparison to the average number of cavities. The four-year Newport average was 1.28 and that for fall 1936, 1.10. However, even these low figures are higher¹⁴ than those secured in 1934 in the other towns.

Combined total fillings. The Newport four-year average for combined total fillings was 1.7 as against an average of 9.8 for combined total cavities.

Affected teeth. The four-year average for Newport was 7.9. This same figure was secured in fall 1936 and is slightly lower than those secured in the other three towns in 1934.

Extracted permanent teeth, carious. The teeth most frequently extracted in the Newport children were the six-year molars, the four-year average for all permanent teeth being .19. The fall 1936 average of .17 is slightly lower than the 1934 averages for the other towns.

No caries. More children with no caries, fillings, or extractions were found in Newport than in any of the other three towns, the figure for Newport being highest in fall 1939. The four-year average was 3.6 per cent.

Malocclusion. Complete records for malocclusion were made in Newport only in 1936 and 1937. The average for these two years was 38.6 per cent. The average for fall 1936 was 42.6 per cent, which is slightly higher than the results secured in the other towns. Irregular occlusion was the most common type seen but upper protrusion was also very common. Irregular occlusion results from underdevelopment of the jaws, usually due to early loss or severe decay of the deciduous teeth. Underdevelopment of the jaws may also be hereditary or result from poor bone development. It seems probable that an improvement in calcium metabolism, beginning during prenatal life and continued through adolescence,

¹⁴ One of the dentists in Newport made a practice of putting in numerous small fillings rather than a smaller number of larger ones. This may account for the slightly higher average for Newport as compared with the other towns.

might result in better developed jaws and better teeth in Maine children.

Hypoplastic enamel. According to the four-year average, only 2.7 per cent of the Newport children showed hypoplastic enamel in either their deciduous or permanent teeth. In the fall of 1936 the average was 2.9 per cent, which was similar to the figures secured in Mars Hill and Monmouth. The Jonesport figure was slightly lower. According to McCall (1938), hypoplastic enamel in the deciduous teeth is chargeable to prenatal systemic disturbance. In the six-year molars the disturbance may be either prenatal or postnatal but in the other permanent teeth the condition results after birth. Eliot, Souther, et al (1934) state that the usual type of hypoplastic enamel seen in permanent teeth is definitely associated with rickets in early life, although in some cases the effect of certain severe infectious diseases, such as pneumonia and bronchitis, may be superimposed on the effect of rickets. Brucker (1943) found that teeth (deciduous or permanent) which are visibly hypoplastic are not especially subject to decay. According to McCall (1938), however, caries in hypoplastic permanent teeth is apt to result when the pits and grooves are of such depth as to make self-cleansing and cleansing by the tooth brush difficult. McCall also believes that hypocalcification of the enamel of deciduous teeth makes them more subject to decay. (See Brucker, 1943, p. 116.)

Six-year molars. Since the six-year molars are the first permanent teeth to erupt, and also usually the first to decay, studies of the condition of these teeth have been made on groups of children in various parts of the U. S. and the results used to indicate dental conditions in the particular areas. In a previous study in Maine (Clayton, 1940) 80.3 per cent of the grade-school children in Mars Hill, Jonesport, and Monmouth were found to have one or more of their six-year molars carious, filled, or extracted (pits and fissures not counted). This figure is similar to the one secured by Davies (See Roberts, 1935, p. 11) for a non-dairy section of Massachusetts but is almost twice as high as the one secured by Whitacre (1934) for Texas children. In Table 22 the results are given for the incidence of caries in the six-year molars of the Newport children. The four-year average shows that in 91.2 per cent of the children one or more of these teeth were carious, filled, or extracted. The percentage of children with these teeth affected

TABLE 22

*Incidence of Caries in the Six-year Molars of Grade-school Children
in Newport, Maine*

Year		No. in group with 4 6-year molars erupted	No. in group with 4 6-year molars sound		No. in group with 1 or more 6-year molars caries,* filled, or extracted		Total 6-year molar teeth caries, filled, or extracted	
			No.	%	No.	%	No.	%
Fall 1936	Girls	90	8	8.9	82	91.1	232	64.4
	Boys	105	19	18.1	86	81.9	271	64.5
	Total	195	27	13.9	168	86.2	503	64.5
Fall 1937	Girls	93	3	3.2	90	96.8	288	77.4
	Boys	99	6	6.1	93	93.9	319	80.6
	Total	192	9	4.7	183	95.3	607	79.0
Fall 1938	Girls	105	6	5.7	99	94.3	332	79.1
	Boys	99	3	3.0	96	97.0	322	81.3
	Total	204	9	4.4	195	95.6	654	80.2
Fall 1939	Girls	103	13	12.6	90	87.4	294	71.4
	Boys	91	13	14.3	78	85.7	259	71.2
	Total	194	26	13.4	168	86.6	553	71.3
4 years	Total	785	71	11.3	714	91.2	2317	74.3

* Fissures and pits omitted. Decalcified areas counted.

by caries was lowest in the fall of 1936 and highest in 1938. The Newport results for all four years are somewhat higher than those secured in the other three Maine towns in 1934.

Gums. The gums were examined chiefly to detect any inflammation possibly related to vitamin C deficiency. It is well known, however, that there are a number of other causes for inflammation, such as irregular occlusion, poor oral hygiene, irritation from decayed and broken teeth, and infections.

As shown in Table 20, between fall 1937 and spring 1938 there was a sharp increase in the percentage of Newport children who had inflamed gums. By the following fall (1938) the number of children showing inflammation had decreased about half but the fall figure for 1938 was higher than those for the other three years. Figures for spring 1939 and 1940 were not as high as those for spring 1938 but in each year the spring figures were higher than the fall. Since the inflammation of the gums was shown to be

TABLE 23

*Results of Six-hour Vitamin C Saturation Tests as Related to Gum Inflammation
Newport, Fall 1938*

Ages	Total No. in age group	Increase in vitamin C excretion less than 50 mg. on 2nd day of test					Increase in vitamin C excretion more than 50 mg. on 2nd day of test					Per cent of age group with both low test and abnor. gums		
		Condition of gums					Condition of gums							
		Healthy	General redness	+ to 2+ inflam.	Local- ized* inflam.	Pale with hyper.	Healthy	General redness	+ to 2+ inflam.	Local- ized* inflam.	Pale with hyper.			
													No.	No.
Girls	19	3	0	1	2	2	8	0	3	0	0	42.1	42.1	26.3
	9	3	0	2	0	0	1	0	0	2	1	55.6	55.6	22.2
	23	6	0	3	2	2	9	0	3	2	1			
	Total Girls													
Boys	23	5	2	2	0	1	8	0	4	0	1	43.5	43.5	21.7
	16	3	0	9	0	0	3	0	1	0	0	75.0	62.5	56.3
	39	8	2	11	0	1	11	0	5	0	1			
	Total Boys													
Total group (boys and girls)	No.	14	2	14	2	3	20	0	8	2	2	Per cent of total group with low test 52.2	Per cent of total group with abnor. gums 49.3	Per cent of total group with low test and abnor. gums 31.3
	Per cent of total group	20.9	3.0	20.9	3.0	4.5	29.9	0	11.9	3.0	3.0			

* Inflammation around certain teeth, associated with caries, malocclusion, or heavy deposits of calculus.

† Increase less than 50 mg. on 2nd day of test.

definitely related to vitamin C deficiency (See p. 132) it appears that the winter diets especially must have been low in this vitamin. (See p. 156 for comments on diets.)

The tendency to inflammation of the gums was also shown in the other three Maine towns where studies were made (See Table 21) but the figures for those towns were lower than those for Newport. The differences are no doubt partly due to the fact that when the Newport examinations were made more of the cases of slight localized inflammation were included.

Six-hour vitamin C saturation tests. These tests were carried out in the fall of 1938 on a group of 67 of the Newport children in order to determine whether or not any relationship could be shown between the gum inflammation which had been found and vitamin C deficiency. The method used in carrying out the test was described on p. 87. Gum examinations were made by Dr. Woods approximately three weeks before the tests were begun and again shortly after they were completed. The criteria used in rating the gum inflammation were given on p. 88. The results of the tests are given in Table 23.

In the group of 67 children there were 34 with definitely healthy gums and 33 with abnormal gums. The abnormal group included 2 boys whose entire gums were redder than usual; one of these also showed some hypertrophy. According to Kruse (1942, p. 293) this redness is characteristic of the second stage in the sequence of pathological changes produced in the gums by vitamin C deficiency. Twenty-two others in the group with abnormal gums showed + to 2+ inflammation of the type which is considered characteristic of vitamin C deficiency; 4 showed only localized inflammation around certain teeth (associated with caries, malocclusion, or heavy deposits of calculus) and 5 showed gums which were pale in color and hypertrophied. Kruse (1942, p. 295) states that this pale color, with swelling, indicates beginning subsidence of the type of acute inflammation which is caused by vitamin C deficiency. Dr. Woods also came to this same conclusion at the time he made the gum examinations.

As shown in Table 23, approximately one-half (52.2%) of the total group showed an increased excretion of less than 50 mg. of vitamin C on the second day of the test (following a 400 mg.

dose of vitamin C in tablet form).¹⁵ Both of the children with unusually red gums were in this group, together with approximately two-thirds (63.6%) of those showing + to 2+ inflammation. One-half of those with localized inflammation and three-fifths of those with pale, hypertrophied gums were also in this group.

Of the 34 children with healthy gums 14 showed an increased excretion of less than 50 mg. of vitamin C on the second day of the test. It thus appears that a child showing gum inflammation is very apt to show a low result in the vitamin C saturation test, but that the absence of gum inflammation does not necessarily indicate good nutrition with respect to vitamin C.

Since the same amount of vitamin C (400 mg.) was given to each subject on the second day of the saturation test, it seemed possible that, on account of their larger body size and greater activity, the older children might show a smaller increase in excretion on the second day of the test than the younger children. They would thus be falsely rated as being deficient in vitamin C. As indicated in Table 23 a higher percentage of the older children did show low results in the test. However, since, in the older group of boys, there was also a higher percentage who showed both inflamed gums and low results in the test it seems probable that the test dose used was high enough. The fact that a higher percentage of both boys and girls in the older age groups showed low results in this test indicates that vitamin C deficiency is particularly apt to occur during adolescence when the demand for this vitamin is high.

In case the saturation test is used in future studies, it may seem desirable to base the dosage of vitamin C (on the second day of the test) on body weight, according to the method of Harris and Abbasy (1937). A uniform dose of 400 mg. of vitamin C was used in the present study for the sake of simplicity in handling the children. The use of 50 mg. as the dividing line between high and low results allowed for considerable range in response in the large and small children.

The diet records secured on the two days of the tests did not indicate a very close relationship between the results of the tests and the amount of vitamin C in the diets on those two days. How-

¹⁵ Thirty-five and eight-tenths per cent of the group showed an increased excretion of less than 10 mg. on the second day of the test.

ever, in the group of 24 children who showed an increase of less than 10 mg. of vitamin C on the second day there were 9 whose diets were rated poor in vitamin C and only 4 which were rated good. The other 11 were rated fair.

TABLE 24

*Results of Vitamin C Tests for Cure of Inflamed Gums
Newport, Spring 1939*

Before therapy		After therapy					
Condition of gums	No. cases	Healthy		Definite improvement		No change	
		No.	Per cent	No.	Per cent	No.	Per cent
Healthy (controls)	3	3	100	0	0	0	0
General redness							
with hypertrophy	2	0	0	2	100	0	0
+ inflammation	10	3	30	4	40	3	30
++ inflammation	8	1	12.5	7	87.5	0	0
+++ inflammation	3	0	0	3	100	0	0
Total	26						

Vitamin C tests for cure of inflamed gums. This test was carried out in March 1939 on a group of 26 Newport children. The procedure used was described on p. 88 and a summary of the results is given in Table 24. It will be seen from the table that the 3 children who served as controls still showed healthy gums at the end of the test period of three weeks. Of the 23 others, 4 showed healthy gums, 16 showed definite improvement, and 3 no change at the end of three weeks. Of the 3 who showed no change one was a 14-year-old girl who had severe malocclusion. Another was a 9-year-old boy in poor physical condition, with extensive caries in his deciduous molars. The third was a 7-year-old boy who appeared to be in good general condition. His failure to respond to the increased intake of vitamin C cannot be explained. From these results it seems evident that most of the gum inflammation seen in the Newport children was of the type which responds to treatment with vitamin C.

HOME VISITS

Home visits in Newport were made in October, November, and December of 1937. Form 3 (Appendix) was used to record the following data for each child who was examined at school: family history, home conditions, home food production and preservation, prenatal conditions, early and present diets and health. Some difficulty was experienced in securing definite answers to a few of the questions, since the mothers often could not remember certain facts, especially regarding their own diets during pregnancy and the early diets and health of the children. As far as possible various topics will be considered in the same order as they are given in Form 3.

TABLE 25

Nationality of Parents of Newport Grade-school Children

	Both parents American	1 American 1 Canadian	1 American 1 Italian	1 American 1 English	1 American 1 Austrian (Jewish)
No. children	176	18	2	1	1
Per cent children	83.4	8.5	1.0	.5	.5

	Both parents Canadian	Both parents Finnish	1 Canadian 1 ?	1 French 1 ?	1 American 1 ?
No. children	5	2	1	1	4
Per cent children	2.4	1.0	.5	.5	1.9

NATIONALITY OF PARENTS

Information regarding the nationality of the parents was not secured for 29 of the 240 children whose homes were visited. Of the remaining 211 children 83.4 per cent had American parents; 8.5 per cent had one American and one Canadian parent; and 2.4 per cent had parents who were both Canadians. (See Table 25.) The only foreign countries represented were Italy, England, Austria, Finland, and France (one family each).

LANGUAGE SPOKEN IN THE HOMES

English was spoken in all of the homes visited, although in one home French also was spoken.

OCCUPATIONS OF CHIEF WAGE EARNERS

Classification of occupations. The occupations of the chief wage earners in the Newport families visited were summarized under the following headings:

1. Laborers. Persons doing manual work whose incomes were apt to be seasonable or variable, such as farm laborers, truck drivers, factory workers, road workers, carpenters, painters, garage workers, etc.

2. Business, professional, and semi-professional people. Persons such as doctors, dentists, owners of any business, government employees, salesmen, office workers, etc., whose incomes were usually either adequate or at least fairly regular.

3. Farmers. All persons owning or renting and operating farms.

4. Miscellaneous. Persons not included in the above groups, as: persons who were retired, on a pension, not working but on relief, etc.

5. Unemployed, with very little or no outside help.

In Table 26 the summary of occupations for Newport is given together with data for the other Maine towns in which similar studies were made in 1934-35.

It will be noted that the figures for Newport are not very different from those for Mars Hill, except that there were fewer persons unemployed in Newport. It should be explained, however, that in Newport 10.6 per cent of those classed as laborers were working on W.P.A. projects and 4.6 per cent of these were also receiving additional state or town assistance. Another 4.6 per cent of the group of laborers were receiving state or town assistance but were not working on W.P.A. projects. W.P.A. was not in existence early in 1935 when the studies were made in the other Maine towns.

TABLE 26
Classification of Occupations of Chief Wage Earners in Families of Grade-school Children in Four Maine Towns

Locality	Year	Total No. families	Laborers		Business professional, etc.		Farmers		Miscellaneous		Unemployed	
			Number of families	Per cent	Number of families	Per cent	Number of families	Per cent	Number of families	Per cent	Number of families	Per cent
Newport	*1937	132	66	50.0	38	28.8	13	9.8	7	5.3	8	6.1
Mars Hill	1935	92	38	41.3	26	28.3	10	10.9	2	2.7	16	17.4
Jonesport	1935	53	29	54.7	12	22.6	1	1.9	5	9.4	6	11.3
West Jonesport	1935	48	35	72.9	9	18.8	0	0.0	1	2.1	3	6.3
Monmouth	1935	43	11	25.6	11	25.6	14	32.6	5	11.6	2	4.7
North Monmouth	1935	31	21	67.8	5	16.1	8	9.7	1	3.2	1	3.2
Monmouth rural	1935	20	7	35.0	2	10.0	8	40.0	0	0.0	3	15.0
Totals		419	207	49.4	103	24.6	49	11.7	21	5.0	39	9.3

* Last quarter. All others are for first quarter.

TABLE 27
Education of Parents of Newfport Grade-school Children

	Total No.	Did not complete elementary school		Completed only elementary school		Completed elementary and indicated number of years of high school								Completed elementary, high school and college or normal school		Completed elementary, some high school and business school	
		Per cent		Per cent		1		2		3		4		Per cent		Per cent	
		No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
Fathers	123	10	7.8	51	39.8	5	3.9	16	12.5	10	7.8	27	21.1	3	2.3	6	4.7
Mothers	132	13	9.8	42	31.8	9	6.8	20	15.2	11	8.3	23	21.2	7	5.3	2	1.5

At the time the home visits were made, many housewives, whose husbands were in the group of laborers, commented on their low family incomes and the difficulty they were having in providing adequate meals. Inquiries made by the writer in the spring of 1940 indicated that economic conditions in Newport were worse during the school year of 1937-38 than during the other three years of the study.

In comparison with Newport there was a higher percentage of laborers in Jonesport, West Jonesport, and North Monmouth, where many worked in factories. In Jonesport and West Jonesport there were canneries where various fish products, such as clam chowder and herring, were canned. In North Monmouth there were several textile mills, but at the time the home visits were made most of the mills were running only part time. In Jonesport, West Jonesport, and North Monmouth the women of the families often earned some of the living by working part time.

As is indicated in Table 26, only 9.8 per cent of the Newport wage earners were classed as farmers, although 14.5 per cent of the families lived outside of the village. Monmouth was the chief farming town included in the present study, although there were very few farmers in North Monmouth. There was only one farm family in Jonesport. This is a seacoast town and the majority of families visited lived in the villages along the rocky shore where the soil is not well adapted to gardening.

EDUCATION OF PARENTS

The education completed by the fathers and mothers of the Newport grade-school children is summarized in Table 27. About 28 per cent of both parents had either finished high school or gone on to college, normal school, or business school. About 27 per cent had finished one, two, or three years of high school and about 36 per cent had only completed elementary school.

FOOD PRODUCTION AND PRESERVATION FOR FAMILY USE

Milk supply. In Table 28 information is given regarding the milk consumption of the Newport families as compared with the families in the other Maine towns where surveys were made. It

TABLE 28
Milk Supply in Families of Grade-school Children in Four Maine Towns

Locality	Year	Total No. families	Families having one or more cows			Av. fresh milk consumption per person in families having cows			Families without cows			Av. fresh milk consumption per person in families without cows			Families using only canned milk		Families* using fresh milk plus supplements of skim milk, cream, or canned milk	
			No.	Per cent	No. persons	Quarts	No.	Persons	No.	Per cent	No. persons	Quarts	No.	Per cent	No.	Per cent	No.	Per cent
Newport	1937	136	23	16.9	133	.67	113	83.1	589			.37	12	8.8	22	16.2		
Mars Hill	1935	90	20	22.2	113	.67	70	77.7	379			.21	9	10.0	38	42.2		
Jonesport	1935	53	7	13.2	36	.71	46	86.8	237			.21	10	18.9	25	47.2		
West Jonesport	1935	48	2	4.2	11	1.14	46	95.8	232			.20	16	33.3	27	56.3		
Monmouth	1935	43	20	46.5	132	.45	23	53.5	109			.38	1	2.3	4	9.3		
North Monmouth	1935	31	17	54.8	108	.76	14	45.2	76			.42	0	0.0	7†	22.6		
Monmouth rural	1935	20	8	40.0	62	.80	12	60.0	67			.32	1	5.5	6	30.0		
Totals		421	97	23.0	595	.66	324	77.0	1719			.29	49	11.6	129	30.6		

* Families without cows.

† Last quarter. All others are for first quarter.

† One other family used skim milk only.

will be seen that the average daily milk consumption of the Newport families having cows (.67 qt. per person) was the same as the average for Mars Hill. The Newport average for families without cows (.37 qt. per person) was similar to the Monmouth average and somewhat higher than the Mars Hill, Jonesport, and West Jonesport averages. This average seems low, however, for rural communities where milk is produced in considerable quantity. A great deal of milk which was being shipped out of the state would have been retained for local use if the demand had been sufficient. Only 16.2 per cent of the Newport families without cows were using supplements of skim milk, cream, or canned milk. Twelve Newport families were using canned milk only.

Fresh milk being consumed in comparison to milk needed. In order to determine how the amounts of fresh milk consumed by Newport families compared with the amounts considered necessary for good nutrition, calculations of the requirements were made, based on a daily allowance of 1 quart for children under 5 years, 3 cups for children between 5 and 15 (inclusive), and 1 pint for those 16 and over. In Table 29 the results for Newport are compared with those previously secured for the other three Maine towns. It will be seen that fresh milk consumption in Newport was only a little more than half of that which is considered desirable for good nutrition. The total amount used was sufficient to adequately supply only the children under 16. The amount of fresh milk consumed in the town of Monmouth was much nearer to the amount needed than that used in any of the other three towns.

As is shown in Table 28 the milk situation in Mars Hill and Jonesport is not quite as bad as it appears in Table 29, since more families in these two towns were using canned milk and other supplements to the supply of fresh milk. It is unfortunate that it was impossible to secure accurate information regarding the amounts of these supplements which were ordinarily used. From the information obtained, however, it was very evident that the amount of cream, canned and skim milk used did not by any means supply the equivalent of the amount needed in addition to the fresh milk already being consumed.

TABLE 29
Fresh Milk Consumed in Comparison to Milk Needed in Families of Grade-school Children in Four Maine Towns

Locality	Year	Number families visited	Average number in household	Average number children under 5	Average number children between 5-15 (incl.)	Average quarts fresh milk consumed per day	Average quarts needed per day	Average quarts needed for children	Per cent of total milk needed which was consumed
Newport	1937*	136	5.3	.48	1.9	1.9	3.4	1.9	57.7
Mars Hill	1935	90	5.5	.40	2.2	1.7	3.5	2.1	48.6
Jonesport	1935	53	5.7	.64	2.2	1.6	3.7	2.3	43.2
West Jonesport	1935	48	5.1	.38	2.3	1.2	3.3	2.1	36.4
Monmouth	1935	42	5.6	.45	2.1	2.3	3.6	2.0	63.9
North Monmouth	1935	31	5.9	.58	2.3	3.5	3.5	2.3	92.1
Monmouth rural	1935	21	6.3	.95	2.2	3.5	4.2	2.6	83.3
Four Towns		421	5.5	.50	2.1	2.0	3.5	2.1	55.9

* Last quarter. All others are for first quarter.

TABLE 30

Percentage of Families Having Gardens and Chickens

Locality	Year data were secured	Total number families	Per cent having gardens	Per cent having chickens
Newport	1937*	136	80.1	16.9
Mars Hill	1935	92	91.4	37.0
Jonesport	1935	53	62.3	32.1
West Jonesport	1935	48	50.0	25.0
Monmouth	1935	43	93.1	51.2
North Monmouth	1935	31	100.0	35.5
Monmouth, rural	1935	20	100.0	60.0

* Last quarter. All others are for first quarter.

Vegetable gardens and chickens. The percentage of families in the different towns who had vegetable gardens and chickens is given in Table 30. It will be seen that 80.1 per cent of the Newport families had gardens but only 16.1 per cent had chickens. Newport was lower than Mars Hill or Monmouth in the percentage of families having gardens and lower than any of the other three towns in the percentage having chickens. The fact that Newport is a more compact village than either Mars Hill or Monmouth may partly account for the smaller percentage of families in that town who were producing some of their own food.

In Newport 15.4 per cent of the families were raising one or more animals, such as pigs or calves, for use as meat. Similar information was not secured for Jonesport and Monmouth, but in Mars Hill, in the fall of 1935, 45.4¹⁶ per cent of the families were raising animals for meat.

Fruits. (See Tables 31 and 32.) Apples were the chief fruit, exclusive of berries, raised in the four towns where surveys were made. The percentage of families in each town who either had trees of their own or secured fruit from relatives was as follows: Newport 25.3, Mars Hill 10.8 (1934) and 16.5 (1935), Jonesport 4.0, and Monmouth 49.0. In Monmouth in 1934 a considerable number of families reported that they also raised pears, plums, cherries, and grapes.

¹⁶ See footnotes to Table 31. P. 142.

TABLE 31

Percentage of Newport and Mars Hill Families Who Raised,
Canned, and Stored Specific Foods*

Foods	Newport—1937-38 134 families†			Mars Hill—1935-36 121 families‡		
	Raised	Canned	Stored	Raised	Canned	Stored
	%	%	%	%	%	%
Fruits						
Apples and crab apples	25.3	16.4	11.9	16.5	49.6	14.1
Berries, kind unknown	—	2.2	—	—	—	—
Blackberries	14.9	17.2	—	—	—	—
Blueberries	13.4	15.7	—	19.0	23.1	—
Cherries	—	—	—	—	.8	—
Cherries, choke	—	—	—	1.7	.8	—
Cranberries	5.2	3.0	—	14.1	—	—
Currants	—	—	—	2.5	—	—
Gooseberries	—	—	—	2.5	5.0	—
Grapes	2.2	.8	—	—	—	—
Melons	3.7	—	—	—	—	—
Peaches	—	6.7	—	—	3.3	—
Pears	.8	5.2	—	—	3.3	—
Plums	1.5	6.0	—	5.8	25.6	—
Raspberries	47.0	36.6	—	9.2	80.2	—
Strawberries	20.9	25.4	—	63.6	57.9	—
Vegetables						
Beans, shell	10.5	11.9	—	9.1	9.9	—
Beans, string	75.4	73.1	—	90.9	80.2	—
Beets	65.7	27.6	32.8	82.6	49.6	38.0
Beet greens	65.7	6.7	—	82.6	28.9	—
Broccoli	3.0	—	—	—	—	—
Brussels sprouts	1.5	—	—	—	—	—
Cabbage	26.1	.8	—	46.3	.8	47.1
Carrots	64.9	11.2	46.3	85.1	33.9	63.6
Cauliflower	2.2	—	—	6.6	—	—
Catsup	—	1.5	—	—	—	—
Celery	3.0	—	—	—	—	—
Chard, Swiss	25.4	5.2	—	47.1	28.9	—
Corn	55.2	32.8	—	63.6	29.8	—
Eggplant	.3	—	—	—	—	—
Cucumbers	56.7	53.7	—	69.4	95.9*	—
		(Pickles)			(Pickles)	
Dandelions	55.2	17.9	—	71.1	14.1	—
Endive	32.8	10.5	—	10.7	5.0	—
Fiddleheads	—	—	—	58.7	13.2	—
Greens, unspecified	3.0	16.4	—	—	—	—
Kale	.8	—	—	.8	—	—
Kohlrabi	—	—	—	3.3	—	—

* Or picked wild.

† 14.5 per cent were rural.

‡ 28.1 per cent were rural.

TABLE 31—(Continued)

Foods	Newport—1937-38 134 families†			Mars Hill—1935-36 121 families†		
	Raised	Canned	Stored	Raised	Canned	Stored
Vegetables (Cont.)	%	%	%	%	%	%
Lettuce	56.7	—	—	81.8	—	—
Onions	7.5	—	—	33.1	—	—
Parsnips	8.2	—	2.2	27.3	—	15.7
Peas	42.5	28.4	—	76.0	41.3	—
Peppers	—	—	—	.8	—	—
Peppergrass	—	—	—	2.5	—	—
Potatoes	17.9	—	49.3	40.5	—	68.6
Pumpkin	16.4	—	11.9	32.2	3.3	17.4
Radishes	30.6	—	—	57.9	—	—
Rhubarb	.8	10.5	—	29.8	30.6	—
Rutabagas	39.6	—	29.1	47.9	—	61.2
Spinach	21.6	2.2	—	26.5	8.3	—
Squash	25.4	—	21.6	52.1	.8	24.0
Tomatoes	71.6	57.5	—	74.4	31.4	—
Miscellaneous						
Meat, fish, chicken	—	3.7	—	—	—	—
Mincemeat	—	11.2	—	—	—	—

In Newport raspberries were cultivated to some extent for the market and 47 per cent of the families reported that they either raised them or picked wild ones. As indicated in Table 31, strawberries, blackberries, blueberries, and cranberries were also picked for home use.

In Mars Hill in 1934 berries were raised or picked wild by 69.5 per cent of the families. Strawberries, raspberries, blueberries, high-bush cranberries, currants, and gooseberries were the kinds gathered. In 1935 (see Table 31) 63.6 per cent of the families reported that they picked strawberries. These were mostly wild.

Blueberries were plentiful in the vicinity of Jonesport and 79.2 per cent of the families reported that they picked them and one or more of the following other kinds of berries: raspberries, strawberries, cranberries (high- and low-bush), blackberries, gooseberries, and baked apple (cloud berries).

In Monmouth the only varieties mentioned were strawberries, raspberries, blueberries, and blackberries, which were picked by 78.7 per cent of the families.

TABLE 32

Percentage of Families in Four Towns Who Canned and Stored Specific Foods

Foods	Mars Hill 91 families		Jonesport 101 families		Monmouth 97 families		Newport 134 families	
	Summer-1934		Summer-1934		Summer-1934		Summer-1937	
	Canned	Stored	Canned	Stored	Canned	Stored	Canned	Stored
	%	%	%	%	%	%	%	%
Fruits								
Apples	19.8	2.2	11.9	1.0	10.3	9.3	11.9	11.9
Berries	69.2	—	79.2	—	78.4	—	55.9	—
Cherries	—	—	—	—	1.0	—	—	—
Crab apples	—	—	—	—	4.1	—	4.5	—
Cranberries	—	—	—	—	—	1.0	3.0	—
Grapes and grape juice	—	—	1.0	—	4.1	—	.8	—
Peaches	8.8	—	6.9	—	4.1	—	6.7	—
Pears	6.6	—	9.9	—	49.5	—	5.2	—
Plums	15.4	—	13.9	—	13.4	—	6.0	—
Vegetables								
Beans, shell	—	—	1.0	—	35.0	1.0	11.9	—
Beans, string	74.7	—	63.4	—	86.6	—	73.1	—
Beets	42.9	22.2	33.7	17.8	30.9	49.5	27.6	32.8
Cabbage	—	40.0	—	16.8	—	48.5	—	19.4
Carrots	16.5	50.4	11.9	46.5	5.2	72.2	11.2	46.3
Catsup	—	—	1.0	—	4.1	—	1.5	—
Cauliflower	4.4	—	—	—	2.1	—	—	—
Celery	—	—	—	—	—	1.0	—	.8
Corn	15.4	—	8.9	—	51.6	—	32.8	—
Greens	41.8	—	43.6	—	53.7	—	40.4	—
Mixture for soup	1.1	—	—	—	—	—	—	—
Onions	—	4.4	—	1.0	—	2.1	—	.8
Parsnips	—	6.7	—	2.0	—	6.2	—	2.2
Peas	42.9	—	42.6	—	43.3	—	28.4	—
Peppers	—	—	—	—	1.0	—	—	—
Pickles	56.3	—	69.3	—	84.5	—	53.7	—
Potatoes	—	76.7	—	75.3	—	83.5	—	49.3
Pumpkin	1.1	—	7.9	6.9	4.1	8.3	—	11.9
Rhubarb	11.0	—	8.9	—	9.3	—	10.5	—
Sauerkraut	—	1.1	—	—	—	—	.8	—
Rutabagas	—	60.0	—	57.4	—	51.6	—	29.1
Squash	2.1	5.6	4.0	10.9	2.1	11.3	—	21.6
Succotash	—	—	—	—	1.0	—	—	—
Tomatoes	31.9	—	8.9	—	79.4	—	57.5	—
Miscellaneous								
Beef	1.1	—	2.0	—	4.1	—	—	—
Chicken	3.3	—	2.0	—	1.0	—	2.2	—
Eggs	—	—	2.0	—	—	—	—	—
Ducks	—	—	1.0	—	—	—	—	—

TABLE 32—(Continued)

Foods	Mars Hill 91 families		Jonesport 101 families		Monmouth 97 families		Newport 134 families	
	Summer-1934		Summer-1934		Summer-1934		Summer-1937	
	Canned	Stored	Canned	Stored	Canned	Stored	Canned	Stored
Miscellaneous (Cont.)	%	%	%	%	%	%	%	%
Fish, kind unspecified	—	—	14.9	—	2.1	—	.7	—
Herring	—	—	3.0	—	—	—	—	—
Mackerel	—	—	17.8	—	—	—	—	—
Meat, kind unspecified	1.1	—	2.0	—	11.3	—	—	—
Minced meat	1.1	—	5.9	—	27.8	—	11.8	—
Pork	—	—	—	—	2.1	—	—	—
Veal	—	—	—	—	2.1	—	—	—
Venison	—	—	5.0	—	1.0	—	.7	—

Vegetables. The various kinds of vegetables raised by the Newport families in the summer of 1937 and by the Mars Hill families in the summer of 1935¹⁷ are given in Table 31. The kinds of vegetables raised by 50 per cent or more of the Newport families were: string beans, beets, carrots, corn, cucumbers, dandelions (wild), lettuce, and tomatoes. Those raised by 50 per cent or more of the Mars Hill families included the same list plus fiddle-heads (wild), peas, radishes, and squash. In Newport less than 25 per cent of the families raised the following vegetables which are important from a nutritive standpoint: spinach, potatoes, green peppers, kale, broccoli, and shell beans. In 1935 less than 25 per cent of the Mars Hill families raised green peppers, kale, broccoli, and shell beans.

Canning. (Fruits) As is shown in Table 32 berries were the kind of fruit canned by the most families in all four towns. (The figures in the tables do not include jellies and preserves.) Apples, plums, pears, and peaches were also frequently canned.

¹⁷ In Mars Hill in 1935-36 an attempt was made to discover how much improvement in the nutritive status of grade-school children could be brought about through improvements in the family diets. In order to encourage gardening and canning, federal seeds were supplied to 33 parents who made application. Also an F.R.A. canning center was operated during the summer. This was used by approximately 45 families having children in the grade school.

Pears were especially popular in Monmouth, no doubt because they were available from trees in the locality.

(Vegetables) The vegetables canned by the most families in all four towns were string beans, pickles, and greens. Since pickles have very little food value in the diet, except as appetizers, it is unfortunate that so many housewives canned them in preference to more nutritious vegetables. Beets and peas also were canned often in all four towns. Corn was especially popular in Monmouth and Newport, shell beans in Monmouth, and tomatoes in Mars Hill, Monmouth, and Newport. The supply of ripe tomatoes in Mars Hill was fairly limited, since at the time this study was made families had not yet learned that, in order to secure sufficient ripe fruit during a short growing season, it is necessary to choose early varieties (see p. 180) and start the plants in the house. The data for Mars Hill, given in Tables 31 and 32, show that more of the Mars Hill families canned fruits and vegetables in 1935 than in 1934.

(Meats, poultry, fish, etc.) Meats were not canned by many families but mincemeat was canned by 27.8 per cent of the families in Monmouth and 11.8 per cent of those in Newport. In Jonesport, 35.7 per cent of the housewives reported that they had canned fish; 5 per cent had canned venison, and 2 per cent coots (a sea bird).

Although the percentage of families, in all four towns, who canned certain fruits and vegetables was quite high the quantities canned by the majority of housewives were not sufficient to supply their families throughout the winter. At the time the home visits were made in Mars Hill, Jonesport, and Monmouth, early in 1935, many families had only a few jars left which they were saving for special occasions.

In the early spring, nearly all families made use of wild greens, such as dandelions and fiddleheads, but when these were gone there were no fresh garden vegetables available until the last of June. This means that there are long intervals in the late spring and early summer when many families have to buy all of the vegetables they use.

Storage. (Fruits) Apples were practically the only fruit stored in any of the four towns. (See Tables 31 and 32.)

(Vegetables) The chief vegetables stored in all four towns were beets, cabbages, carrots, potatoes, and rutabagas. Many Newport and Mars Hill (1935) families also stored squash.

PRENATAL HISTORY

As shown in Form 3 (Appendix) information was secured for each Newport child regarding the mother's diet and health during pregnancy and conditions prevailing at birth. In Table 33 this information is summarized separately for each of the four towns.

TABLE 33

Summary of Prenatal History and Basic Feeding during Infancy

Town	Total number of children	Abnormal pregnancy	Inadequate diet during pregnancy	Premature birth	Breast fed 5 months or more	Breast fed 9 months or more	Weaned from breast after 12th month
		%	%	%	%	%	%
Newport	280	17.3	79.2	2.7	34.4	28.3	3.1
Mars Hill	143	20.3	61.5	7.9	43.8	35.0	4.4
Jonesport	174	17.2	77.0	5.3	46.6	38.7	7.5
Monmouth	153	14.4	77.1*	8.6	51.9	37.7	5.2

Character of pregnancies. It will be seen that, according to the statements of the mothers in the different towns, between 14.4 and 20.3 per cent of the pregnancies were abnormal, having been accompanied by persistent vomiting, kidney trouble, or other disturbances. Accurate information regarding diets during pregnancy was difficult to secure but approximately three-fourths of the diets were probably inadequate. Lack of sufficient milk was the chief dietary defect noted, although lack of sufficient fruits, vegetables, and eggs was commonly admitted.

Vitamin D in prenatal diets. In judging the adequacy of the prenatal diets, as reported in the table, vitamin D was not considered, since no mother was found in any of the four towns who had taken cod liver oil or any similar product containing vitamin D. As stated by Park (1940), "the foods that comprise the diet of the average person are almost lacking in vitamin D.... The amount in milk is negligible. Average butter is estimated as containing only 80 units per hundred grams, making its potency about one one-hundredth that of average cod liver oil. Liver may

contain a small amount but not enough to have any practical value." Hen's eggs may contain considerable amounts of vitamin D but the amount is extremely variable, since it depends on the amount of ultraviolet radiation (from sunlight or an ultraviolet lamp) which the birds receive and the amount of vitamin D in their food. For these reasons eggs are not considered to be reliable sources of the vitamin. Certain kinds of oily fish, such as herring, sardines, salmon, and tuna, contain significant amounts of the vitamin but are not ordinarily eaten in sufficient amounts to meet vitamin D needs during pregnancy. During the summer months it would be possible to secure adequate vitamin D from sunlight, but probably few women take sufficient advantage of their opportunity to secure it. It can be said, therefore, that most of the mothers were deficient in vitamin D during pregnancy.

Standards for calcium and vitamin D during pregnancy and lactation. The value of vitamin D in pregnancy and lactation has been emphasized by many workers in the field of nutrition. In an article in the *Journal of the American Medical Association*, Jeans and Stearns (1938) state that during pregnancy and lactation, calcium and vitamin D are the two factors most often deficient in the mother's diet. They emphasize that vitamin D alone does not insure adequate retention of calcium unless sufficient calcium is present in the diet. During pregnancy from 1.4 to 1.6 grams of calcium are needed daily. These are the amounts contained in 5 and 5.5 cups of milk. If the mother cannot drink sufficient milk to secure this amount of calcium, Sullivan (1944) suggests that dicalcium phosphate be prescribed by her physician. The same author recommends 600 to 1,000 units of vitamin D daily in the form of a concentrate from fish liver oil.

During lactation the drain on the mother is even more severe than during pregnancy and Jeans and Stearns (1938) state that ample calcium is imperative. They recommend a daily intake of at least 2 grams and at least 800 or more units of vitamin D.

HISTORY DURING INFANCY

Premature births. As shown in Table 33 the percentage of premature births was lower in Newport than in the other three towns.

General condition at birth. The mothers of 219 of the Newport children gave reports of the general condition of their children at birth. The condition of 94.5 per cent of the babies was said to have been good; 2.3 per cent were described as "thin." One baby had jaundice; one, club foot; and two, ruptures.

Basic feeding. Table 33 shows that 34.4 per cent of the Newport children were breast fed 5 months or more, 28.3 per cent 9 months or more, and 3.1 per cent 12 months or more. These figures are lower than those secured in the other towns. The majority of the Newport babies who were artificially fed received modified fresh cow's milk, although 11.5 per cent received evaporated, condensed, or dried milk for at least part of their first year. When feeding problems occurred, various proprietary infant foods were often tried. Many of these are dextrinized or malted cereal products, sometimes containing in addition one or more of the following: lactose, inorganic salts, and powdered cow's milk. Most of them are added to fresh cow's milk, although a few, which contain sufficient milk, merely require the addition of water. These preparations are relatively expensive, selling for between 69 and 94 cents a pound.

Choice of sugar for infant feeding. The sugars commonly used in infant feeding are: cane sugar, corn syrup, dextrimaltose, and lactose. According to the Council on Foods of the American Medical Association (1937) "the choice of sugar for use in infant feeding is of relatively minor importance as compared with other problems of infant feeding." There are times, of course, when physicians prescribe one carbohydrate preparation in preference to another, especially for its laxative or non-laxative effect. It would appear, therefore, that unless the physician advises to the contrary it would be better to use an inexpensive sugar such as Karo corn syrup rather than the more expensive carbohydrate preparations. That would leave more money to be spent for orange juice, cod-liver oil, and other necessary supplements.

Substitutes for fresh cow's milk. In Newport, as well as in the other towns, various brands of evaporated and condensed milk were used. One Newport child received plain dried milk, 5 evaporated milk, and 20 condensed milk for at least a part of the first year. Condensed milk is ordinarily sweetened, the finished product containing 40 to 45 per cent of cane sugar. According to Marriott (1935, p. 204) it "is not a suitable food for infant feeding. When

given in sufficient amount to supply the necessary calories, there is too little milk present to provide sufficient protein, mineral salts, and vitamins. Such a one-sided diet may lead to rapid increase in weight, but infants are as a class flabby and have very poor resistance to infections."

Evaporated or dried milk is much better suited to infant feeding, since the amount of sugar added to the formula can be properly regulated. Most evaporated and some dried milks are now irradiated, which adds vitamin D, not enough, however, to completely supply the needs of the infant.

TABLE 34

Data on Infant and Preschool Diets

Town	Total number of children	Supplements during first year							Preschool diet	
		Orange juice	Tomato juice	Orange juice, tomato juice, or both	Cod liver oil	Egg	Vegetables including potatoes	Cereals	Average amount milk daily after 1st year	Cod liver oil daily after 1st year
		%	%	%	%	%	%	%	cups	oz.
Newport	230	60.4	25.6	62.2	38.7	69.6	85.6	87.4	3.0	2.0
Mars Hill	138	64.5	13.0	64.5	29.0	56.5	65.8	70.0	2.6	1.0
Jonesport	168	58.3	8.9	58.3	17.3	45.8	72.6	75.0	2.7	1.0
Monmouth	153	55.7	24.2	58.8	18.3	58.1	79.1	86.4	2.8	1.0

* Or other vitamin D preparation.

Supplements during infancy. The mothers in the four towns were questioned regarding the foods, other than milk, which the babies had received during their first year. Very few remembered accurately the month when each food was begun or the amount given, but it was possible to secure statements regarding the kinds of foods given. A summary of this information is given in Table 34. It will be seen that the percentage of children who received orange juice, tomato juice, or both was about the same in the four towns. A higher percentage of the Newport children received cod liver oil, egg, and vegetables (including potato), but the percentage of children who had cod liver oil was significantly low in all towns.

Next to potato, carrots were the vegetable most often fed. In all four towns cereals and vegetables were the supplements most generally used, but very often potato was the chief vegetable fed.

Need of breast-fed babies for vitamin D. Some parents, as well as physicians, are of the opinion that breast-fed babies do not need cod liver oil (or other source of vitamin D) as a preventive of rickets. Jeans and Stearns (1938) and other authorities state that, since mother's milk varies in its vitamin D content, and babies in their store of vitamin D at birth, it is best to give breast-fed babies the same amount as is prescribed for those artificially fed. Jeans and Stearns (1938) state that the vitamin D requirement of the full term artificially fed baby is between 300 and 400 units a day. Premature babies may require twice this amount during the period of most rapid growth.

Feeding problems. In the Newport group 21.5 per cent of 219 babies were reported to have had feeding problems or frequent digestive upsets. Most of the feeding problems were said to be due to the failure of breast milk or cow's milk formulas to agree with the children. Three babies could not tolerate orange juice.

Illnesses during the first year. Following is a summary of the illnesses reported for 196 of the Newport babies during their first year:

	%		%
Abscesses	.5	Kidneys	.5
Anemia	.5	Measles	5.6
Bronchitis	1.5	Mumps	1.0
Chicken pox	2.0	Pneumonia	3.1
Colds	2.6	Rickets	.5
Croup	.5	Scarlet fever	.5
Ear abscess	1.0	Tape worm	.5
Intestinal flu	1.5	Whooping cough	6.6
Jaundice	.5	Worms	.5

PRESCHOOL HISTORY

Food dislikes. The preschool children in all four towns had numerous food dislikes and the majority of these were among the commonly used vegetables. In Newport 26.5 per cent of the children disliked one or more kinds, the ones most frequently mentioned being carrots, onions, greens, tomatoes, string beans, pota-

toes, and rutabagas. Meat was disliked by 5.7 per cent and milk by 2.6 per cent.

Foods withheld. Among the Newport children 30 per cent had certain foods withheld during their first three years. Those most frequently mentioned were dried beans and meat. Corn, pickles, and fried meats were also withheld by several mothers.

Milk consumption. As shown in Table 34 the average daily milk consumption of the Newport preschool children was 3 cups; 35.7 per cent of the group had 2 cups or less. The averages for the other three towns were slightly lower.

Sources of vitamin D. Table 34 also shows that about one fifth of the Newport children had received cod liver oil or other source of vitamin D regularly during their preschool years; about half of the children had received none. The percentage figures for the other towns are somewhat lower. A considerable number of the children in all four towns had received such preparations as Scott's Emulsion, Father John's Medicine, and Wampole's Tonic, which cost more than cod liver oil in proportion to their vitamin D content. Many mothers stated that their older children would not take cod liver oil but few had tried giving any of the vitamin D (and A) concentrate preparations in capsule form.

Standards for vitamin D. Jeans and Stearns (1938) state that for children between infancy and adolescence a daily allowance of from 300 to 400 units of vitamin D is satisfactory. Follis, Jackson, Eliot, and Park (1943) also emphasize the importance of vitamin D throughout the period of skeletal growth. McBeath and Zucker (1938) recommend 800 units daily as a preventive of dental caries. During the late fall and winter the sunlight which reaches Maine is deficient in the actinic rays which generate vitamin D in the skin. Therefore it is advisable to give preschool and older children cod liver oil (or a similar source of vitamin D) regularly between September and June. Cod liver oil and other fish oils are also valuable for their content of vitamin A.

The question of "sweets." According to the mothers, 40.3 per cent of the Newport children had eaten many sweets during their preschool years. Dr. H. C. Sherman (1929) gave the following advice regarding the use of sugar in children's diets: "Sugar should be of all foods the most cautiously used in feeding children lest it displace too much of the foods which can do what it cannot in supplying the proteins, vitamins, and mineral elements which

children need so urgently and so abundantly for their healthy growth and development."

General health and appetite. In Newport 88.8 per cent of the preschool children were reported to have had good health and 88.0 per cent good appetites.

Illness. The illnesses reported for the preschool years will be summarized with those for the school years. See p. 170.

FOOD HABITS OF GRADE-SCHOOL CHILDREN

On the day of the home visit each mother was asked to state as nearly as possible what each child had eaten the previous day. At the same time questions were asked regarding the type of meals which he usually had, his food preferences, the frequency with which he ate certain foods, and his health habits, illnesses, etc.

Foods eaten the day before the home visits. The information secured regarding the foods which the children had eaten the day before the home visit was probably fairly accurate, since such a short time had elapsed. While a record of the foods eaten on a single day may, in certain cases, give an incorrect impression of the child's customary diet, the averages obtained from a large number of such records give a valuable indication of food habits in a certain locality. A summary of the information obtained in Newport, together with that for the other three towns, is given in Table 35.

Consumption of various foods. In the table the data have been classified in such a way that it is possible to determine what types of foods were consumed most and how consumption varied in the different localities. The figures given for milk are not for the amounts consumed on the day preceding the visit but are for the average daily consumption as stated by the mothers.

(Milk.) It will be noted that the average daily milk consumption of the Newport children was 2.2 cups, which is close to the average for the four towns. Milk consumption was highest in Monmouth and lowest in Jonesport, but even in Monmouth only 44.3 per cent of the children received 3 or more cups per day. In Newport 31.0 per cent of the children received 3 or more cups daily.

(Fruit.) In all four towns only 53.2 per cent of the children had fruit of any kind, the highest consumption being in Newport and the lowest in rural Monmouth. The higher fruit consumption in Newport may be partly explained as being due to the fact that

TABLE 35
Percentage of Children Who Were Served Various Foods the Day Before the Home Visit

	1934-35								Average of four towns	
	Newport	Mars Hill	Jonesport	West Jonesport	Average		North Monmouth	Monmouth rural		All Monmouth
					Jonesport and West Jonesport	Monmouth				
2 to 2.9 cups milk	26.8	27.7	25.6	22.9	24.2	31.0	16.0	24.3	24.7	25.8
3 cups milk or more	31.0	26.4	20.0	21.8	20.9	33.8 *	60.0	43.2	44.3	30.4
Average cups milk per child	2.2	2.1	1.7	1.9	1.8	2.1	2.9	2.5	2.4	2.1
Fruit, any kind besides fruit pudding or pie	65.4	47.3	42.2	56.2	49.4	46.5	56.0	29.8	45.6	53.2
Citrus fruit	12.6	18.9	10.0	29.2	19.9	23.9	30.0	2.7	20.9	17.6
Tomatoes	8.2	16.2	3.3	6.3	4.8	14.1	12.0	16.3	13.9	10.2
Citrus fruit and/or tomatoes	20.0	29.7	13.3	31.2	22.5	33.8	38.0	18.9	31.6	25.2
Raw vegetable, excluding tomatoes	3.5	0.0	1.1	5.2	3.2	0.0	2.0	2.7	1.3	2.2
*2 vegetables, not tomatoes, potatoes or dried beans	26.4	24.3	24.4	12.5	18.3	22.6	38.0	2.7	22.8	23.1
*1 (only) vegetable, not tomatoes, potatoes, or dried beans	31.6	45.3	21.2	19.8	20.5	28.2	18.0	54.0	31.0	31.4
Baked beans	15.2	21.0	33.3	11.5	22.0	12.7	22.0	21.0	17.7	18.7
Baked beans only, as a vegetable, besides potatoes and tomatoes	3.0	7.4	13.3	8.3	10.7	7.0	16.0	16.2	12.0	7.8
Potatoes, once only	43.3	50.8	71.2	54.2	62.4	60.6	42.0	43.3	50.7	51.4
Potatoes, twice or more	48.5	43.2	13.3	29.2	21.5	24.0	30.0	35.2	28.5	36.1
Meat, poultry, or fish once only	45.9	50.7	73.4	53.1	62.9	53.5	50.0	48.7	51.3	52.4

* Not including vegetable pies such as pumpkin and squash.

TABLE 35—(Continued)

	1934-35							Average of four towns		
	Newport	Mars Hill	Jonesport	West Jonesport	Average Jonesport and West Jonesport	Monmouth	North Monmouth		Monmouth rural	All Monmouth
Meat, poultry, or fish twice or more	27.7	35.2	11.1	36.4	24.2	35.2	26.0	13.5	27.2	28.2
Eggs	29.9	23.6	7.8	20.8	14.5	15.5	32.0	13.5	20.2	22.6
Cereal, any kind	85.3	71.7	57.8	65.6	61.8	76.1	70.0	81.1	75.4	74.3
Whole grain cereal	72.3	56.1	37.7	46.8	42.4	67.6	56.0	75.7	65.8	59.8
Hot breads	25.5	37.1	23.4	37.5	30.7	19.7	28.0	35.2	26.0	29.3
Doughnuts, cookies, or cake	80.5	71.7	77.8	94.8	86.6	84.6	94.0	84.0	88.0	81.9
Doughnuts, cookies, or cake twice or more	49.8	44.5	40.0	52.1	46.2	50.8	46.0	43.2	47.5	47.3
Puddings and pies	39.4	39.9	30.0	21.8	25.8	43.7	52.0	35.2	44.3	37.1
Fruit puddings and pies	15.2	11.5	12.2	8.1	7.5	29.5	28.0	21.6	27.0	15.1
Vegetable pies	9.5	8.8	4.4	1.0	2.7	1.4	0.0	2.7	1.3	5.8

the home visits in that town were made in the late fall and early winter when more apples were available.

The consumption of citrus fruit was quite variable in the different towns, the percentage range being from 2.7 in rural Monmouth to 30.0 in North Monmouth. Only 12.6 per cent of the Newport children had it. In all four towns oranges were available in the village grocery stores at the time the home visits were made, but apparently the price was too high for many of the families.

The consumption of tomatoes also was variable and low in all towns. Only 8.2 per cent of the Newport children had them. The lowest consumption was in Jonesport where fewer families had gardens in which they could raise their own crop for canning.

Considering the citrus fruits and tomatoes in one group, on account of their vitamin C content, it will be seen that in all four towns only 25.2 per cent had one or the other, or both, the day before the home visit. The consumption of other foods which are good sources of vitamin C (such as raw cabbage, raw rutabagas, and raw salad greens) was negligible, as can be seen in the table.

(Vegetables.) It is considered desirable that children should have at least two vegetables daily besides potato and that, in order to supply vitamin A, at least one should be green or yellow. In all four towns 23.1 per cent of the children had two vegetables, not including tomatoes, potatoes or dried beans and 31.4 per cent had only one. However, these figures do not include pumpkin and squash used in pies. In Newport only one child had any leafy greens (not including 8 who had head lettuce) but 47.2 per cent had at least one serving of such green and yellow vegetables as peas, string beans, carrots, squash, and pumpkin. This figure includes the squash and pumpkin used in pies. The consumption of squash and pumpkin was higher in Newport than in the other towns owing to the fact that the Newport home visits were made during the Thanksgiving season when more of these vegetables are used. Rutabagas were eaten by 4.8 per cent of the Newport children. This vegetable can be an excellent source of vitamin C if eaten raw or cooked for a short time in a small amount of water. However, even though yellow in color it is low in vitamin A.

In Mars Hill the vegetables (besides tomatoes, potatoes, and dried beans) eaten most were string beans, carrots, and rutabagas;

Jonesport children ate mostly onions and rutabagas, while those in Monmouth favored string beans, cabbage, carrots, and corn.

Baked beans were eaten quite generally, the most being used in Jonesport. The average for all four towns was 18.7 per cent. This figure no doubt would have been higher if diet records for Saturdays had been obtained on Sundays. Dried beans are a good source of protein, calcium, iron, and vitamin B₁. They also contain riboflavin and niacin but are low in vitamin A and lacking in vitamin C. On account of their protein, iron and vitamin B (complex) content they can be used to some extent (especially during war time) as a substitute for meat, fish, poultry, and eggs. However, since the protein of dried beans (except soy bean protein) is of rather poor quality they should not be used too frequently as a substitute for these foods.

Potatoes were eaten once or more by 87.5 per cent of the children in all four towns. As would be expected, the highest percentage of those who ate them was in Mars Hill. Considering their high nutritive value it is fortunate that they are so widely used. In composition they resemble enriched white bread and contain, in addition, a small amount of vitamin A and considerable vitamin C (if cooked to prevent loss).

(Meat, poultry, and fish.) As shown in Table 35, meat and fish were used very generally in all four towns; poultry was used much less frequently. Beef was the meat used most and pork next. The most pork was used in Mars Hill and the least in Monmouth. Frankfurters were especially popular in Jonesport where 12.6 per cent of the children ate them on the day before the home visit. In Newport a number of the families were eating venison at the time of the home visits. Several housewives stated that they were fortunate to have it, since they could not afford to buy other meat.

As would be expected, much more fish was used in Jonesport than in the other towns. In Mars Hill, Jonesport, and Monmouth clams were mentioned most often but in Newport oysters were more popular at the time of the home visits. Canned salmon was used a great deal in Newport, Mars Hill, and Monmouth.

(Eggs.) The percentage of children who ate eggs on the previous day ranged from 7.8 in Jonesport village to 32.0 in North Monmouth. In Newport 29.9 per cent of the children had them.

(Cereal.) Cereal breakfast foods were used on the previous

day by an average of 74.3 per cent of the children in all four towns, the percentage of those who had them being highest in Newport. The figures for whole grain cereal show that 80.5 per cent of those who ate breakfast cereal had some kind made from whole grain. Approximately half of the cereal used was oatmeal.

(Flour products.) Home made flour products such as biscuits, rolls, cookies, cakes, doughnuts, and pies were very popular in all four towns. Hot breads were eaten by 29.3 per cent of the children and an average of 81.9 per cent had cookies, cake, or doughnuts. Moreover, an average of 47.3 per cent of the children had them twice or more on the day before the home visit. Practically all of the cake, doughnuts, and pies and many of the cookies and hot breads were made from white flour, which at that time was not enriched.

(Desserts.) An average of 37.1 per cent of the children in all towns had puddings and pies for dessert, 15.1 per cent of which contained fruit and 5.8 per cent pumpkin or squash.

Foods ordinarily eaten. (Breakfasts.) According to the reports of the Newport mothers, 89.7 per cent of the children ordinarily had good appetites and 84.3 per cent ate a sufficient amount of food at breakfast. However, the reports of the kinds of foods usually eaten by many of the children for breakfast showed a tendency to omit fruit and to include a doughnut or cookie along with cereal, toast, and milk or cocoa to drink. Eggs also were frequently eaten. Occasionally pie, cake, and baked beans were mentioned as items in the breakfasts.

(*Dinners and suppers.*) Dinners eaten at noon at home were ordinarily fairly substantial meals which included meat or fish, potato, bread, another vegetable, and dessert (usually cake, pie, or pudding). Suppers, however, were apt to be poorly planned. Very often they consisted of hash made from left over vegetables and meat, mixed vegetables, or potato only, bread, rolls, or biscuits, canned fruit ("sauce"), cake or cookies, and milk. Other dishes sometimes served for suppers were: cold meats, baked beans, eggs, fish chowders and stews made with milk, soups and stews containing meat and vegetables, and escalloped macaroni with cheese and/or tomatoes. Freshly cooked vegetables, except potatoes, salads made with raw vegetables, creamed vegetable soups (except tomato), and fresh fruits were seldom served for suppers.

(*Box lunches eaten at school.*) The majority of the lunches

eaten by the children at school consisted of sandwiches, milk, fruit, and cake, cookies, or doughnuts. Very few contained any raw vegetables. Many of the children also had candy following their lunches. At the time the home visits were made no hot school lunches were being served in any of the four towns, although at present hot lunches are being served in Newport.

TABLE 36

*Cooked Vegetables, Besides Potato, Eaten Most by Newport
Grade-school Children*

Vegetable	No. times vegetable was mentioned	Per cent of group of 240 children	Vegetable	No. times vegetable was mentioned	Per cent of group of 240 children
1. Carrots	160	67.1	10. Greens	46	19.2
2. Tomato	156	65.0	11. Onions	20	8.3
3. Beets	80	33.3	12. Tomato (in soup)	9	3.8
4. String beans	77	32.1	13. Mixed veg. (in soup)	6	2.5
5. Cabbage	77	32.1	14. Parsnips	5	2.1
6. Peas	74	30.1	15. Baked beans	2	.8
7. Rutabagas	70	29.2	16. Lima beans	2	.8
8. Squash	64	27.1	17. Shell beans	2	.8
9. Corn	53	22.1	18. Cauliflower	1	.4

(*Cooked vegetables, besides potato, eaten most.*) The cooked vegetables eaten most by the Newport grade-school children are given in Table 36 in the order of the frequency with which they were mentioned by the mothers. It is of interest that carrots and tomatoes, two of the most nutritious vegetables which are commonly available, headed the list. Only 4 of 240 children were said to like all cooked vegetables; 123 (51.2 per cent) liked more than three kinds; and 31 (12.9) per cent disliked all cooked vegetables and ate very few or very little of any kind.

(*Preferred raw vegetables.*) The raw vegetables eaten most were as follows, in the order of frequency with which they were mentioned: cabbage, carrots, lettuce, onions, and rutabagas. However, in October, November, and December of 1937 only 10 (4.2 per cent) were eating a raw vegetable at least once a day, and for 5 of these the raw vegetable was onions. (In one family onions

were sliced and allowed to stand in vinegar. The writer considered these as pickles rather than raw vegetables since the vinegar would cause the rapid loss of the vitamin C in the onions.) Approximately 12 per cent of the children had a raw vegetable between three and six times a week; 30 per cent had one once or twice a week; 26 per cent had one only occasionally, and 26 per cent had none. No doubt raw vegetables, especially tomatoes and lettuce, were eaten more often during the summer months.

(Fruits eaten most.) The fruits eaten most were as follows, in the order of frequency with which they were mentioned: apples, bananas, oranges, grapefruit, and grapes. Only 5 per cent of the children had oranges or grapefruit once a day or more; 27.5 per cent had them three to six times a week; 13.3 per cent had them once or twice a week, and 31.3 per cent had none. The low consumption of citrus fruits at the time of the home visits (fall 1937) was no doubt partly due to the fact that these fruits were rather high priced at that time of year and many families were in unusually poor financial circumstances. (Diet records kept for one week by the children in the spring of 1938 showed that only 11.2 per cent of the children had citrus fruit at least once a day.)

(Cereals eaten most.) The cereals eaten most, in order of frequency, were as follows: oatmeal, shredded wheat, cornflakes, Cream of Wheat, puffed wheat, Maltex, Wheaties, Ralston, and puffed rice. The popularity of cornflakes is rather significant, since, at the time this survey was made, this cereal was not enriched and the food value was low in comparison to that of oatmeal, shredded wheat, and other whole grain cereals.

(Frequency of eating dark-breads.) The results of the Newport study indicated that 18.4 per cent of the children ate dark bread once a day or more; 34.3 per cent had it between one and six times a week, but 27.6 per cent had none. Many of the families frequently had homemade Graham rolls and Boston brown bread. Purchased dark breads included whole wheat, cracked wheat, and rye breads. The low consumption of dark breads was more significant at the time this survey was made than it would be at present, since at that time breads, flour, and cereals were not enriched. Since these findings indicate a general preference for white bread and the frequent use of refined breakfast cereals, it seems important that government regulations providing for the enrichment of cereal products should be continued after the war.

(*Favorite desserts.*) The desserts mentioned most often were pies, puddings, cakes, cookies, and doughnuts. Fresh fruits were not often used as desserts but canned fruit was frequently served for suppers with cake or cookies.

(*Frequency of eating candy.*) According to the statements of the Newport mothers 57.1 per cent of the grade-school children had candy oftener than twice a week; 28.7 per cent had it once a week or less.

(*Milk consumption.*) The average daily milk consumption (including milk in cocoa) of the Newport children was 2.2 cups. Thirty-one per cent received 3 cups or more and 26.8 per cent 1 cup or less. (For a comparison of the results with those for other towns, see Table 35.)

(*Tea, coffee, and cocoa.*) Among the Newport children coffee was drunk once a day or oftener by 10 per cent of the children but very few drank tea. The consumption of cocoa as compared with that in the other three towns is given in Table 37.

TABLE 37

Percentage of Children Who Drank Cocoa

	Daily	Less often	None
	Per cent	Per cent	Per cent
Newport	27.4	62.9	9.7
Mars Hill	29.5	50.0	20.5
Jonesport	18.4	53.2	28.4
Monmouth	21.9	48.4	29.7

(*Source of vitamin D.*) Questions regarding the use of cod-liver oil or other source of vitamin D during the winter months showed that only 10.3 per cent of the Newport children were getting it regularly. A comparison of data for all four towns is given in Table 38. The higher percentage for Jonesport can be explained as being due to the fact that physicians in that town were distributing cod liver oil supplied by the F.E.R.A. As stated before, many mothers in all four towns complained that the children would not take plain cod liver oil but few had tried giving any of the vitamin D concentrates in capsule form.

TABLE 38

*Percentage of Children Taking Cod Liver Oil**

Newport—1937-38			Mars Hill—1934-35			Jonesport—1934-35			Monmouth—1934-35		
Total No. in group	Per cent regular	Per cent irregular	Total No. in group	Per cent regular	Per cent irregular	Total No. in group	Per cent regular	Per cent irregular	Total No. in group	Per cent regular	Per cent irregular
234	10.3	4.7	148	14.2	4.0	186	22.5	4.8	158	4.4	3.8

* Or other vitamin D preparation.

Diet records kept at school by grade-school children. During the four-year Newport study diet records for one week were kept at three different times (fall 1936, spring 1938, and spring 1940) by all children above the third grade. Similar records were also secured in Mars Hill in the spring of 1937. Form 4 (Appendix) was used for the records and the teachers gave time twice a day to assist the children in writing down what they had eaten, together with approximate amounts or number of servings. In Table 39 is given the percentage of children who met or exceeded the standard for each food group. The standards for a good diet were adapted from Stiebeling and Clark (1939).

The table indicates that about three-fourths of the children in the two towns met the potato standard and over half met the standard for meat, fish, or poultry. The percentages for the other food groups were lower and decreased in the following order: eggs, whole grain products, milk, other fruits and vegetables, citrus fruits and/or tomato, and green or yellow vegetables. The very low figures for citrus fruit and/or tomato and green or yellow vegetables are especially significant, since these foods are needed in the diet to supply vitamins C and A. The Newport figures for green and yellow vegetables seem particularly low considering the fact that on the day before the home visit 47.2 per cent of the children were said, by the mothers, to have had a green or yellow vegetable. Possibly the discrepancies in the data obtained from the two types of records may be partially explained by the differences in time when the records were obtained; by the fact that, in some cases, the mothers may have mentioned the foods served, and the children only those actually eaten; and by the fact that the figures

TABLE 39

Per cent of Newport and Mars Hill Grade-school Children Who Met or Exceeded the Standards for a Good Diet

	Year	No. in group	No. days	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8
				Milk	*Citrus fruit and/or tomato	Green or yellow vegetable	White potato	Other fruits and vegetables	Eggs	Meats, fish, poultry	Whole grain products
Minimum standard number servings per day				cups 3	1	1	1	2	.5	1	1
				Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
Newport	Fall 1936	94	5 to 7	40.4	5.3	9.6	85.1	33.0	40.4	57.5	41.5
	Spring 1938	125	5 to 7	28.4	16.8	8.0	87.2	15.2	44.0	51.2	39.2
	Spring 1940	131	5 to 7	29.0	6.1	6.1	68.7	17.6	58.0	60.3	41.2
Mars Hill	Spring 1937	126	5 to 7	15.9	13.5	.8	72.2	7.1	57.1	61.1	18.3

* Also canteloupe, fresh red raspberries, and fresh strawberries.

Note: Dry legumes, extra green and yellow vegetables, and extra citrus fruits and tomatoes were counted in group 5. Extra foods in groups 6 or 7 were counted so as to satisfy both groups as nearly as possible.

from the children's records given in Table 39 are based on averages for 5 to 7 days. This would probably make them lower than those based on the single day's records given by the mothers. The evident tendency of the children to eat more of the group 5 vegetables and fruits in the fall and more citrus fruits and eggs in the spring can be partly explained on the basis of differences in the availability and price of these foods at the two seasons of the year.

General character of diets. The above information regarding the foods eaten by the grade-school children in the four towns indicates a relatively high consumption of potatoes, dried beans, cereals, sugar, and white flour products; a moderate consumption of meat and fish, and a relatively low consumption of milk, eggs, fruit (especially citrus), and cooked and raw vegetables (exclusive of potatoes and dried beans). This type of diet tends to be above the average in carbohydrate and low in fat and/or protein, minerals, and vitamins.

A typical diet. In order to indicate the specific deficiencies which characterized many of the diets, a typical diet of a fourteen-year-old boy is given in Table 40. This diet includes foods which are commonly eaten in Maine and indicates the type of meals which many of the grade-school children had on the day before the home visit. It is close to the standard in calories, protein, iron, and vitamin A but is somewhat high in carbohydrate¹⁸ and low in calcium, vitamin B₁,¹⁹ riboflavin, niacin, and vitamin C. The most evident deficiency is in vitamin C. (For comments on vitamin D see p. 161.) As shown in the lower part of Table 40, the deficiency in vitamin C could be almost completely corrected by the addition of 1 cup of tomato juice. The tomato juice would also supply additional vitamin A and would bring the riboflavin and niacin up to the standard. By retaining the tomato juice and substituting enriched white bread for the unenriched the diet could be brought up to the standard in all respects except for calcium and a small amount of vitamin C.

¹⁸ According to Chaney and Ahlborn (1939) the commonly accepted distribution of the three foodstuffs in the diet of the average American child, in terms of the percentage of the total calories, is carbohydrate 50, fat 35, and protein 15.

¹⁹ In some families, especially in Mars Hill, pork was used quite extensively. Since lean pork is high in vitamin B₁, diets containing sufficient amounts of it would not be deficient in this vitamin.

TABLE 40
Typical Diet of a Fourteen-Year-Old Boy

Height 62 inches
 Weight 103 pounds

Foods	Measure as served	Wt. gm.	Cal.	Carb. gm.	Pro. gm.	Ca mg.	Fe mg.	Vitamins				
								A I.U.	B ₁ mg.	Ribo- flavin mg.	Niacin mg.	C mg.
Breakfast	1½ cups	204.0	150	25.2	6.3	30.0	1.82	trace	.210	.087	.49	0.0
Oatmeal	2 teaspoons	8.7	33	8.7	0.0	0.0	0.00	0	.000	.000	.00	0.0
Sugar	½ cup	122.0	85	6.0	4.1	145.5	.30	235	.055	.266	.13	1.8
Milk, pasteurized	1 cup	254.7	141	15.8	5.1	151.5	.46	235	.060	.289	.16	1.3
Cocoa (½ milk)	4 slices	120.0	300	61.3	10.5	69.0	.93	trace	.050	.117	.72	0.0
Toast, white, unenriched	1½ tablespoons	19.5	150	0.0	.2	3.0	.05	825	.000	.000	.00	0.0
Butter												
Dinner	1 large cake	139.0†	200	0.0	27.2	16.0	3.85	37	.224	.307	8.87	0.0
Round steak, lean, ground	1 cup	186.0	200	41.8	4.6	56.0	2.00	400	.124	.154	.67	10.0
Mashed potato	¾ cup	100.0	36	6.6	2.0	33.0	.72	950	.054	.132	.66	2.3
String beans, canned (solids)	2 slices	60.0	150	30.7	5.3	34.5	.47	trace	.033	.059	.36	0.0
Bread, white, unenriched	1 tablespoon	13.0	100	0.0	.1	2.0	.03	550	.000	.000	.00	0.0
Butter	1 piece	85.0	357	58.6	3.8	38.3	.64	132	.040	.096	.30	0.0
Chocolate cake, chocolate frosting	5 large	50.0	160	43.0	0.0	0.0	.00	0	.000	.000	.00	0.0
Gum drops												
Supper	1 cup	186.0	200	41.8	4.6	56.0	2.00	400	.083	.154	.67	0.0
Potato hash*	4 slices	120.0	300	61.3	10.5	69.0	.93	trace	.057	.117	.72	0.0
Bread, white, unenriched	2 tablespoons	26.0	200	0.0	.2	4.0	.06	1100	.000	.000	.00	0.0
Butter												

* Warmd over mashed potato.

† Raw.

TABLE 40—(Continued)

Foods	Measure as served	Wt. gm.	Cal.	Carb. gm.	Pro. gm.	Ca mg.	Fe mg.	Vitamins				
								A I.U.	B ₁ mg.	Ribo- flavin mg.	Niacin mg.	C mg.
Milk, pasteurized	1 cup	244.0	170	12.0	8.1	291.0	.60	470	.110	.531	.26	3.6
Apple sauce	½ cup	139.8	150.	42.2	.6	11.1	.36	101	.038	.042	.06	6.0
Cookies	2, 2½" diam.	28.0	100	14.0	1.4	4.0	.10	200	.012	.018	.15	0.0
Totals			3182	469.0	94.6	1013.9	15.32	5655	1.160	2.839	14.22	25.0
National Research Council Standard†			3200		85.0	1400.0	15.00	5000	1.600	2.400	16.00	90.0
Difference			-18		+9.6	-386.1	+32	+655	-.440	-.061	-1.78	-65.0
Above diet + 1 cup tomato juice			3242	477.5	97.0	1028.9	16.82	7785	1.390	2.464	16.10	83.0
Above diet with 1 cup tomato juice and enriched bread			3242	477.5	97.0	1028.9	22.82	7785	1.964	3.199	23.30	83.0
Above diet with 1 cup tomato juice, 6 slices of enriched bread (instead of 10), and 1 additional pint of milk			3252	440.0	102.7	1341.9	21.62	8725	1.900	3.967	20.94	90.2

† Committee on Food and Nutrition, 1941.

By retaining the tomato juice, reducing the enriched bread from 10 to 6 slices, and adding 1 pint of milk the diet could be made to meet the standards for all of the indicated constituents. The reduction in bread and the addition of the extra pint of milk would bring down the carbohydrate from 58.9 to 53.6 per cent of the total calories and would also supply additional high quality protein, fat, vitamins (especially riboflavin), and minerals including calcium.

The above typical diet would have a slightly alkaline reaction in the body (owing especially to the large amount of potato) and therefore would tend to cause the secretion of a saliva with relatively high acid neutralizing power. The writer considers this to be important from the standpoint of the protection of the teeth against the destructive effect of acids produced by the fermentation of sugars in the mouth. However, the high carbohydrate content of the diet would tend to counteract the potential protective effect of the saliva since it would favor high acid production. (Becks, Jensen and Millar, 1944).

The addition of the tomato juice and milk to the typical diet would make it even more alkaline in reaction in the body, since these foods have a basic ash. With its high potential alkalinity, decreased carbohydrate content, and liberal supply of minerals and vitamins the improved diet could be expected to give much better protection to the teeth than the typical diet. However, in order to give the best dietary protection against dental caries it would probably be necessary to give vitamin D and to restrict the consumption of candy and other sweets (McBeath and Zucker, 1938) (Koehne et al., 1934).

The food value of the above diet was calculated mostly from tables given by Taylor (1942), Macleod and Taylor (1944), Bowes and Church (1939), Chaney and Ahlborn (1939), Clouse (1943), and the Committee on Food Composition of the Food and Nutrition Board of the National Research Council (1944). The figures given for mineral and vitamin content are necessarily only estimates, owing to natural variations in different foods in the raw state and to variations which result from the methods of cooking and canning used.

HEALTH HABITS

Sleep and activity. Questions answered by the Newport mothers regarding hour of retiring, hour of rising, and work outside of school hours indicated that the majority of the children were probably getting enough sleep and were not overworked. Nearly all appeared to be getting a desirable amount of outdoor play and exercise.

Use of laxatives. Irregularities in bowel movement were quite common in Newport, as well as in the other three towns, and the use of laxatives was reported as frequent. Information regarding their use is given in Tables 41 and 42. It will be seen that 61.7 per cent of the Newport children received them at various time intervals. The Mars Hill children showed the highest frequency in the use of laxatives and the Monmouth children the lowest.

TABLE 41

Frequency in the Use of Laxatives

Town	No. of children in group	No. using laxatives	Per cent using laxatives	1/week Per cent	2/week Per cent	1 or 2/week Per cent	3/week Per cent	Daily Per cent	Occasionally Per cent
Newport	240	146	61.7	10.0	5.0	1.7	.8	.8	42.5
Mars Hill	146	73	50.0	21.2	2.7	.7	2.7	2.1	20.6
Jonesport	141	57	40.4	16.3	2.8	6.4	1.4	.7	12.8
Monmouth	128	54	42.2	9.4	1.6	1.6	2.3	.8	26.6

TABLE 42

Percentage of Children Using Various Kinds of Laxatives

Town	No. of children in group	Ex-Lax	True's Elixir	Cascara Sagrada	Castoria	Castor Oil	Agars	Sennas	Mineral Oil	Doctor's prescription	Other
Newport	240	18.8	16.7	.8	3.3	10.4	.4	0.0	5.0	.4	18.8
Mars Hill	146	21.9	3.4	0.0	4.1	2.1	2.1	2.1	1.4	.7	21.9
Jonesport	141	17.0	12.1	0.0	.7	.7	.7	.7	.7	2.8	14.2
Monmouth	128	.8	8.6	7.0	3.9	3.9	2.3	0.0	3.1	0.0	18.8

Causes of constipation in children. According to Aaron (1938, p. 145) the occurrence of constipation in children may be due to several causes, among which are organic disease, wrong type of diet, nervousness caused by wrong attitude of parents, and the use of too many laxatives.

The type of diet which tends to promote constipation is one which is common in Maine and which is low in fruits,²⁰ vegetables, and whole grain cereals. These foods supply fiber, organic acids, sugars, salts, and vitamin B₁, each of which plays a part in the normal functioning of the alimentary tract. Fine grinding and thorough cooking of whole grain cereals tend to prevent the bran from being too irritating to the intestinal tract.

Robertson (1937) has found that both potassium and calcium are necessary to prevent intestinal stasis. Therefore, milk, which supplies calcium and which also tends to be low in Maine diets, may also be important in preventing constipation rather than causing it, as some people believe. Potassium is supplied especially by vegetables and whole grain cereals.

With regard to the attitude of parents upon the frequency of constipation in children, Aaron (1938) states that parents who worry excessively about the occurrence of constipation in themselves are apt to stress regularity in their children to an unreasonable degree. Laxatives are given when unnecessary, with the result that constipation is often actually caused by irritation of the lining of the colon and changes in the muscular coat. The giving of too many laxatives may also cause malnutrition by causing the food to pass through the intestine too rapidly.

Kinds of laxatives used. A wide variety of laxatives was used in the different towns, but, as shown in Table 42, certain kinds were used much more than others.

Ex-Lax was the kind most used in Newport, Mars Hill, and Jonesport. This contains the drug phenolphthalein which acts as an irritant to both small intestine and colon. According to Aaron (1938, p. 126) it has been responsible for marked stomach and intestinal disturbances and in sensitive persons has caused ulcers in the mouth and skin eruptions. He states that the drug and products containing it should be avoided.

²⁰ The lower frequency with which laxatives were regularly used in Monmouth may be related to the more frequent use of apples in that town.

In Newport, Jonesport and Monmouth *True's Elixir* was given to a considerable number of children. This preparation contains senna and aloin. These are irritant drugs which act chiefly on the colon (Wood and Osol, 1943).

Cascara Sagrada was used by 7 per cent of the Monmouth children. This is a useful drug for treating certain types of occasional and habitual constipation in adults but Aaron does not recommend it for children. Its action is on the colon. Many proprietary laxatives contain it.

Senna is also an ingredient of *Caldwell's Syrup of Pepsin and Castoria*. According to Aaron (1938, p. 125) this drug is more powerful than cascara sagrada and it may produce griping and considerable irritation. Therefore it is unsuitable for children.

Castor oil was used by 10.4 per cent of the Newport children. Since the action of both castor oil and calomel is quite drastic they should never be used except on the advice of a physician.

Agar is considered by Aaron (1938, p. 111) as the best of the bulk producing laxatives. It is best taken in the granular form with water. This laxative is, however, better suited to adults than to children.

Mineral oil, which was used by 5 per cent of the Newport children and 3 per cent of those in Monmouth, is a good softening and lubricating agent. However, since it acts as a solvent for the fat soluble vitamins, its frequent use is objectionable.

Milk of magnesia is considered a good laxative for children when one seems necessary, but, as previously stated, this should be very seldom.

Other habits. The mothers in all four towns were questioned regarding the occurrence of such habits as enuresis, thumb sucking, and nail biting in the children. Enuresis and thumb sucking were not very prevalent but constant nail biting (or picking) was quite common in all four towns. According to Griffith and Mitchell (1934, p. 891) this habit is observed only in decidedly nervous children.

ILLNESSES AND OPERATIONS

Table 43 gives information regarding the number of children in the different towns who had had various diseases and operations.

TABLE 43

Number of Children Reported as Having Had Various Diseases and Operations

Total No. records	Newport 1937-38	Mars Hill 1934-35	Jonesport 1934-35	Monmouth 1934-35
	234	141	173	167
Contagious or infectious				
Chicken pox	122	108	95	88
Conjunctivitis	4	3	0	0
Diphtheria	1	0	0	0
Infantile paralysis	1	0	0	1
Influenza	9*	3	10	8
Impetigo	4	0	0	0
Measles, Germ. measles or both	201	96	116	83
Mumps	119	62	63	31
Pneumonia	23	14	14	16
Rheumatic fever	0	2	1	0
Scabies	4	0	0	0
Scarletina	4	3	0	0
Scarlet fever	15	14	8	44
Tuberculosis	0	1	0	0
Typhoid	1	3	1	0
Whooping cough	172	114	144	121
Nervous diseases				
Chorea	0	0	0	2
Convulsions	0	1	2	4
Other diseases				
Abscesses	4	1	2	0
Anemia	6	1	0	1
Appendicitis	4	3	2	3
Asthma	1	0	0	1
Bladder infection	0	0	1	0
Blood poisoning	0	0	0	1
Bronchitis	3	2	4	0
Diabetes	2	1	0	0
Digestive disorders	30	4	2	2
Eczema	1	1	0	0
Infected glands	1	0	0	4
Jaundice	1	4	2	0
Nose bleed	3	0	1	0
Otitis	18	1	2	2
Psoriasis	1	0	0	0
Quinsy	0	0	2	0
Rheumatism	0	0	0	2
Rickets	1	1	0	1
Scurvy	0	1	0	0
Stomatitis	2	0	0	0
Tonsillitis	2	3	3	1
Worms	8†	0	0	0

* Includes 5 cases of intestinal flu.

† Includes 2 cases of tapeworm.

TABLE 43—(Continued)

Total No. records	Newport 1937-38	Mars Hill 1934-35	Jonesport 1934-35	Monmouth 1934-35
	234	141	173	167
Operations				
Appendectomy	8	3	1	2
Circumcision	9	5	2	6
Club foot	1	0	0	0
Cords of heel	0	1	0	0
Cords of neck	0	1	0	0
Eye	0	1	0	2
Glands of neck	0	1	0	1
Hernia	0	1	0	3
Hip manipulation	0	0	0	1
Kidney stones	1	0	0	0
Mastoid	0	0	0	3
Osteomyelitis	1	0	0	0
Rupture	1	0	0	0
Tonsils and adenoids	5	22	15	30
Tumor	2	0	0	0

In some cases the numbers may be low, due to the fact that the mothers forgot to mention certain illnesses.

Illnesses. Among the contagious and infectious diseases listed as affecting the greatest number of children were whooping cough, measles, chicken pox, mumps, pneumonia, and scarlet fever. The number of cases of scarlet fever was especially high in Monmouth. There were no cases of smallpox, only one of diphtheria, and two of infantile paralysis.

Among the other diseases those often mentioned were abscesses, anemia, appendicitis, bronchitis, digestive disorders, jaundice, otitis, and worms. Digestive disorders and otitis were especially frequent in Newport. It is of interest that although the school examinations of the children showed that anemia and evidence of early rickets were quite common, the mothers were apparently unaware of the existence of these conditions. Also, even though a significant number of the children showed inflamed gums, the condition had apparently been noticed by very few of the parents and had been related to a deficiency of vitamin C by none of them.

Operations. By far the most common operation which the children had had was tonsillectomy and adenoidectomy and a considerable number of others were badly in need of the operation.

The next most frequent operations were appendectomy and circumcision.

Immunizations. Answers regarding immunization treatment for prevention of such diseases as smallpox, diphtheria, scarlet fever, typhoid fever, whooping cough, etc., showed that Monmouth was the only town where a significant number of vaccinations against smallpox had been made (30 per cent of the group). None of the Jonesport children had been vaccinated and only 3 per cent of the Mars Hill children and 4 per cent of those in Newport.

In Newport, under the auspices of the Parent Teachers Association, the majority of the children were vaccinated against diphtheria by the State Department of Health. This work was begun in the spring of 1938 and continued in the fall of 1939. However, at the time the home visits were made, only 3 per cent of the group had been vaccinated against diphtheria. Also 3 per cent had been vaccinated against whooping cough.

DISCUSSION

The findings of this study indicate that many of the outstanding health problems of Maine grade-school children are closely related to nutrition. The most serious of these problems are: dental caries, a tendency to retarded bone growth, the prevalence of bone defects resulting from rickets, and the prevalence of inflamed gums resulting from vitamin C deficiency.

The problem of dental caries is the most complex of all, since so many factors may be directly or indirectly responsible for the condition. As is generally well known, the immediate cause of caries is the action on the teeth of acids produced by bacterial action on sugars present in the mouth. The part which nutrition can play in the prevention of caries is, first of all, the provision during the period of tooth and jaw development, of all of the dietary constituents needed for building well-developed jaws and well-formed and adequately spaced teeth. Among the dietary constituents of special importance are calcium, phosphorus, magnesium, traces of fluorine (See p. 175), and vitamins A, C, and D.

Following the eruption of the teeth nutrition is especially important in its effect on the composition of the saliva. Whether

or not erupted teeth can be influenced through the blood stream is still an unsettled question. Since dental caries is caused by the action of acids, a saliva having a high titratable alkalinity tends to neutralize these acids and thus protects the teeth to the extent that it reaches those parts of the mouth where the acid is being produced. (See p. 176 for a discussion of the effect of fluoride in reducing the solubility of tooth enamel.) When the jaws are well developed and the teeth evenly placed (and kept reasonably clean) the saliva has a much better opportunity to reach all of the tooth surfaces than when malocclusion is present. Thus the normal development of the jaws and teeth is of primary importance. Many different factors affect the acid base balance of the body but it is well known that foods play a very important part in maintaining the normal pH of the body cells and fluids. The following foods, which have an alkaline reaction in the body, tend to produce an alkaline saliva: milk, fruits (except cranberries and prunes), and vegetables (except corn). Cereals, meat, and eggs have an acid reaction in the body and tend to produce an acid saliva.

The diets of Maine grade-school children tend to be high in acid-forming foods, especially refined cereal products, and especially low in base-forming foods such as milk, fruits, and vegetables (except potato). Also before bread and flour were enriched, many of the diets were low in thiamin. Without sufficient thiamin, carbohydrate cannot be completely metabolized in the body and lactic and pyruvic acids accumulate in the blood (Chestler et al., 1944), lowering the alkaline reserve. This condition would also tend to produce an acid saliva. The use of enriched bread, whole grain products, and pork should correct any wide-spread deficiency of this vitamin.

Since the acids formed in the mouth are produced from carbohydrates, one way to limit their production is to limit the consumption of carbohydrate. Dr. J. D. Boyd, of the State University of Iowa, (1942) states that the child's diet which he has found effective in the prevention of caries contains about half of the calories in the form of carbohydrate and about one-third in the form of fat.²¹ This division of calories is similar to that mentioned by Chaney and Ahlborn (1939). (See footnote 18, p. 164.)

²¹ This diet includes daily the following foods: 1 quart milk; 1 or 2 eggs; 2 four-ounce servings succulent, leafy, and root vegetables; 2 four-ounce servings fruit, one of which should be orange or other raw fruit (tomato

Potatoes, bread, other cereal products, and sugars are the chief sources of carbohydrate in the diet. Since potatoes are base forming in the body their liberal use as a partial substitute for bread and cereals, makes it easier to prevent an overbalance of acid-forming foods and yet to supply the necessary amount of carbohydrate.

Vitamin D in the form of cod liver oil (or a vitamin D concentrate) has been found to assist in the prevention of dental caries (McBeath and Zucker, 1938). Just how it functions in accomplishing this is not known, but it appears to increase the absorption of calcium and phosphorus from the intestine and thus increases the calcium and phosphorus content of the body fluids, including the saliva. As pointed out by Jeans and Stearns (1938), Sherman (1941), and others, vitamin D cannot function unless adequate calcium (and phosphorus) is available. In some parts of the United States considerable amounts of calcium are available from drinking water and from fruits and vegetables grown in the soil of the particular locality. Dove (1934) has called attention to the fact that the surface waters and soil of Maine are low in calcium. Therefore, it is probable that Maine people secure a relatively small proportion of their needed calcium from their drinking water or foods²² other than milk. Since the calcium content of cow's milk is high and quite uniform, irrespective of the diet of the cow (Sherman, 1941), this food is the most reliable source of calcium in the diet.

Within recent years there has been a great deal of discussion in the scientific literature regarding the effect of fluorides on the

may be used as a substitute); 1 serving meat, fish, fowl, or liver; 1 teaspoon cod liver oil; and supplementary foods such as potatoes, starches, bread and other cereal products, sweets and fats, in amounts to complete the caloric requirements for full activity.

In a recent paper Boyd (1944) reported the results of studies on diabetic children which indicated that when the diets were high in protective factors certain changes in the proportion of fat and carbohydrate made no difference in the susceptibility of the children to dental caries. However, Boyd's high fat diet contained only 14% of the total calories in the form of carbohydrate and the low fat diet only 32% in the form of carbohydrate.

²² In the production of vegetable and grain crops in Maine calcium is ordinarily added to the soil in the form of powdered limestone. However, the amount of calcium taken up by growing plants is small compared to the amount in milk.

teeth. A high concentration of fluoride in drinking water (from slightly over 1 to 2 parts per million) causes mottled enamel (Smith, Lantz, and Smith, 1931), while a concentration of 1 part per million produces very little mottled enamel and gives marked protection against caries (Dean et al., 1941). This protective effect appears to be greatest during the period of tooth development. Drinking water in several parts of Maine has been shown by the Division of Sanitary Engineering of the State Department of Health and Welfare to be very low in fluorides. Therefore, at some future time dental caries may be reduced in the State by the carefully supervised addition of small amounts of sodium fluoride to public water supplies. However, owing to the possible toxic effects of fluorides, this will probably not be done until further surveys are made regarding the effects of varying amounts of naturally occurring fluorides and fluoride additions on the teeth and general health of selected groups of people.

Another possibility for the reduction of caries has been suggested by the results of recent experiments on the application of dilute fluoride solutions to the surfaces of the teeth. Dr. B. G. Bidley (1942) of Tufts College Dental School applied a 1-1000 solution of sodium fluoride to the teeth (in one quadrant of the mouth) of a group of 78 children over a period of two years and secured a distinct reduction of caries in the treated teeth. Similar results have been secured by other workers (Cheyne and Rice, 1942; Knutson and Armstrong, 1943). The fluoride is apparently absorbed by the tooth enamel, which becomes less soluble in an acid solution (Volker, 1943).

In some parts of the United States fluorides are present in the soil and are taken up in small amounts by growing plants which are used as food for both humans and animals. It seems probable, however, that in Maine, where the surface waters have been found to be low in fluorides, the soil would also be low. No analyses for the fluoride content of Maine foods have as yet been made.

Bone deformities produced by rickets and undersized bones are the types of bone defects which are evident in Maine grade-school children. It seems probable that these could be prevented by the adequate consumption of calcium, phosphorus, and vitamin D during pregnancy, infancy, and childhood. While vitamin C also is known to be necessary for normal bone structure, no

evidence of bone defects due to a deficiency of vitamin C was obtained in this study.

The prevalence of vitamin C deficiency, as indicated by inflammation of the gums, indicates that the problem of providing foods high in vitamin C for all Maine people at all times of the year is one of great importance. Potatoes, which are consumed in considerable quantity, contain significant amounts of vitamin C when dug, but during storage at 38° F. for 6 months lose approximately 40 per cent of their vitamin C content. (Fellers, 1942.) Thus, Fellers reports that Green Mountain potatoes, raised in Massachusetts, contained 16.7 mg. per 100 gms. when dug and 10 mg. after 6 months in storage at 38° F. Some methods of cooking conserve the vitamin much better than others. For instance, Fellers secured a value of 7.3 mg. per 100 gms. for potatoes (after 6 months in storage) boiled whole in the skin (in salted water). The same potatoes baked gave a value of 6.9 mg.; French fried 6.7 mg. and boiled, peeled, in salted water 5.5 mg. Other common methods of cooking gave still lower values and warmed over potatoes and potato salad contained practically no vitamin C. In November, 1939, the writer (Clayton and Folsom, 1940) secured average values of 14.9 mg. per 100 gms. for baked Green Mountain potatoes raised in Maine but there is no doubt that lower values would have been secured later in the season.

Dove and Murphy (1943) reported high values for a number of varieties of Maine potatoes, including Katahdin and Sebago. However, these values were obtained soon after digging. According to Fellers (1942) storage seems to cause a leveling off of the differences between varieties in vitamin C content. The question of the effect of storage is being investigated further at the Maine Station. (See Bul. 426 pp. 304-305.)

The above data indicate that, if properly cooked, potatoes can be a very good source of vitamin C early in the winter. However, since loss in storage is so high, other vitamin C containing foods must be relied on to a great extent, especially during the late winter.

The data presented in this study indicate that apples are the fruit consumed most by grade-school children in the towns where surveys were made. The favorite variety of apples for eating raw appears to be the McIntosh. Unfortunately, this apple, which grows well in Maine climate, is very low in vitamin C. Murphy

and Dove (1943) published a list of eleven varieties of Maine-grown apples, all of which (very soon after harvesting) gave vitamin C values in excess of 16 mg. per 100 gms. These included the following early and late varieties (Comments by Professor J. H. Waring of the Department of Horticulture, University of Maine):

Early

- Red Duchess. A red strain of the old variety, Duchess of Oldenburg. Season: latter half of August. Hardy, attractive, an excellent cooker, well established and adapted to the Maine climate. Available commercially to a limited extent but not abundant at present.
- Red Astrachan. Season: August. Excellent for home and early market. Very hardy. More common in Maine orchards at present than Duchess and Red Duchess.
- Early Harvest. Season: early to mid-August. Very little grown in Maine. The variety is not very hardy but should grow successfully in southern and western Maine.

Late

- Northern Spy. Excellent late winter variety. Still planted to quite an extent. Bitter pit susceptibility and slowness in beginning to bear fruit discourages growers from more extensive planting. The variety is not sufficiently hardy to be successfully grown in central and northern Maine.
- Russet. Both Golden and Roxbury Russets are old, late, excellent keeping varieties, but no longer much planted in Maine. They might well be used more extensively in home orchards.

According to Wolf (1942) loss in storage varies greatly with different varieties. In Wolf's study the average percentage loss during prolonged storage at 2.5° C was 50. Studies of losses of vitamin C in cooking apples indicate that in making apple sauce from peeled apples about 25 per cent of the vitamin is lost. Much

higher percentages are lost in the baking of apples and in making apple pie (Curran, Tressler, and King, 1937).

These findings seem to indicate that if varieties of apples high in vitamin C could be raised to a greater extent in Maine the early varieties, if eaten raw, could be a very good source of vitamin C during the fall months when citrus fruits are expensive. Owing to storage losses, the later varieties, even though eaten raw during the winter, could be counted on as supplying only a small fraction of the vitamin C required for good nutrition.

Fresh and canned tomatoes and tomato juice have long been considered excellent winter sources of vitamin C but, judging from work done at the Maine Agricultural Experiment Station and elsewhere, there is a great difference in the vitamin C content of different varieties of tomatoes and the products made from them. Also, as shown by Murphy (1942) and others, there may be a difference in the same variety of tomato at different seasons and in different years. However, the tendency of a particular variety to be high or low in vitamin C persists from year to year. Murphy and Monroe (1943) showed that differences in the vitamin C content of two varieties of raw tomatoes (Farthest North A and Farthest North C) persisted after the tomatoes were canned and that products made from the variety low in vitamin C lost their vitamin at a higher percentage rate than those made from the variety high in the vitamin.

Tomato juice canned in tin retains its vitamin C better than that canned in glass (Daniel and Rutherford, 1936; Hauck, 1943; and others). The following average results, secured this year in the writer's laboratory, give an example of the loss in vitamin C which can be expected when glass jars of tomato juice are stored at room temperature:

Variety: Farthest North C²³

Vitamin C content of raw tomatoes: 23.5 mg. per 100 gms.

Vitamin C content of canned juice after 1 month storage:

20.1 mg. per 100 gms.; after 3 months, 15.2 mg.;

after 6 months, 12.8 mg.

The effect of storage temperature on the retention of vitamin C in canned tomato products has not been studied, but judging from the results of a recent study on canned citrus fruits (Ross,

²³ Similar results were secured for canned Farthest North C tomatoes.

1944), the vitamin C in canned tomato products would be retained much better in a cool cellar (50-60° F.) than at room temperature.

The above findings indicate that if canned tomatoes or juice are relied on as the chief source of vitamin C in the diet, the amounts consumed in the late winter should be double those consumed in the fall. Also, particularly when tomatoes are raised for home consumption, special consideration should be given to the choice of varieties known to be high in vitamin C. Early varieties shown by Murphy²⁴ (1942 and personal communication) to be high in vitamin C when grown in Maine are: Farthest North C, Comet, Early Trellis, Best of All, and Waltham Forcing. The Farthest North C tomatoes are small in size but are early and especially good for making tomato juice. The other varieties are considerably larger. Bonny Best, Stokesdale and Pritchard, three varieties popular in Maine, are comparatively low in vitamin C. (Clayton, 1944, unpublished data.)

Spinach, fresh, cooked, and canned, is an excellent source of vitamin C. An important characteristic of canned spinach is that it does not lose its vitamin C on storage. This year, in the writer's laboratory, a value of 33 mg. per 100 gms. was secured for canned Nobel spinach after 8 months at room temperature. In canning this spinach the stems were removed and all of the blanching water used in filling the tin cans.

Canned rutabaga greens were also found to be high in vitamin C, although the effect of storage on the vitamin C content has not yet been studied. Rutabaga roots are also an excellent source and retain the vitamin very well in cellar storage.

The above comments indicate that there are a number of factors which affect the vitamin C content of foods as they are eaten. In order to insure an adequate intake of vitamin C throughout the year, Maine families should either make regular use of fresh or canned citrus fruits and juices or a combination of these together with some of the following, according to the season:

Apples, raw. For varieties see above list and comments.

Broccoli (fresh or frozen), raw and cooked (cut in small pieces and cooked in a small amount of water or left in large pieces and steamed or cooked in a larger amount of water).

²⁴ Elizabeth F. Murphy, Assistant Biologist, Maine Agr. Expt. Sta.

- Brussels sprouts (freshly picked or frozen), cooked (in a small amount of water).
- Cabbage, raw and cooked (shredded and cooked in a small amount of water or paned using a small amount of fat).
- Cantaloupe, raw.
- Cauliflower (fresh or frozen), raw and cooked (see broccoli).
- Escarole, raw.
- Green beans (freshly picked or frozen), cooked in a small amount of water.
- Green pepper, raw.
- Kale, raw or cooked (small curls, steamed or cooked in a small amount of water).
- Kohlrabi (freshly picked), cooked.
- Lettuce, raw (large serving).
- Mustard greens (freshly picked), cooked (in a very small amount of water) or canned (using all of the blanching water to fill cans).
- Onions, raw (not soaked in vinegar).
- Parsnips (higher in vitamin C in the fall), cooked (sliced or left whole, in a small amount of water).
- Peas (freshly picked or frozen), cooked (in a small amount of water).
- Radishes, raw.
- Raspberries, raw.
- Rose hips, made into jelly or jam. (Hips from *Rosa Rugosa* are especially high in vitamin C.)
- Rutabagas, raw and cooked (steamed or cooked in a small amount of water).
- Rutabaga or turnip greens, cooked (in a very small amount of water and flavored with a little bacon or salt pork) or canned (using the blanching water to fill cans).
- Spinach, raw, cooked (with only the water which clings to the leaves), and canned (leaves only, using the blanching water to fill the cans).
- Strawberries (fresh or frozen), raw or canned in a medium syrup.
- Tomatoes and tomato juice, raw (in season) and canned (canned tomatoes and green peppers mixed are especially high in vitamin C). For varieties see above list and comments.

SUMMARY

Physical examinations of approximately 220 Newport grade-school children, made fall and spring each year for four years (1936-40), showed the following:

1. Bone defects were very common, many of which were apparently the result of rickets in infancy. Similar defects were seen in the other three towns where surveys were made (Mars Hill, Jonesport, and Monmouth).

2. In the spring of 1937, 72.9 per cent of the Newport children and 63.9 per cent of those in Mars Hill were rated as having good nutrition. In the spring of the next three successive years approximately 81 per cent of the Newport children were rated "good." In these ratings the condition of the teeth and gums and other defects not plainly visible were not considered.

3. Approximately one-third of the Newport children (spring averages 1937-40) and one-half of the Mars Hill children (spring 1937) were more than 6 per cent underweight by the McCloy standards. More girls than boys were underweight.

4. Approximately 4 per cent of the Newport children had enlarged thyroid glands. Similar findings were secured in Monmouth and Jonesport. There were fewer cases in Mars Hill.

5. Newport children, as well as those in the other three towns, were particularly subject to colds, which were often accompanied by earache, tonsillitis, and enlarged cervical glands. Digestive upsets and toothache were also frequently reported.

Physical measurements, made in Newport (1936-40) and in Mars Hill in 1936-37, included height and weight and 12 other measurements needed for determining the McCloy weight, fat, and limb girth indices. Comparisons of height and weight averages for all four towns showed the following:

HEIGHT

1. The fall height averages for the Newport girls showed no significant differences in the different years (1936-40). The spring averages were highest in 1939 and lowest in 1937; the differences between averages for these two years were highly significant.

2. The fall and spring height averages for the Newport boys showed no significant differences in the different years.

3. The 4-year fall height averages for the Newport girls were higher than those for the girls in the other three towns. The differences between the Newport and Jonesport averages were highly significant.

4. There were no significant differences between the 4-year fall height averages for the Newport boys and the 3-year fall averages for the Mars Hill boys, but the Newport boys tended to be taller than those in the other two towns. The differences between the Newport and Jonesport averages were highly significant and those between Newport and Monmouth significant.

5. The Mars Hill and Jonesport girls and the Jonesport boys tended to be shorter than public school children in other parts of the United States. The groups measured in all four towns were significantly shorter than the Iowa City children studied by Meredith and Boynton and the private school children studied by Gray and Ayres.

WEIGHT

1. The average fall weights of the Newport girls were significantly higher in 1939 than in 1937. The spring averages in the different years showed no significant differences.

2. There were no significant differences between either the average fall or the average spring weights of the Newport boys in the different years.

3. The 4-year fall weight averages for the Newport girls were not significantly different from the averages for the girls in the other three towns. However, the averages for the Mars Hill and Monmouth girls were significantly higher than those for the Jonesport girls.

4. The 4-year fall weight averages for the Newport boys were significantly higher than those for the Mars Hill boys. The differences between the Mars Hill, Jonesport, and Monmouth averages were not significant.

5. The fall weight averages for the Newport and Jonesport girls were significantly lower than the U. S. averages but the fall averages for the boys in each of the four towns showed no significant differences from the U. S. averages. In comparison with the Iowa and Gray's averages the differences for both girls and boys in all four towns were highly significant, the Maine averages being lower.

TYPE OF BUILD

1. Comparisons of the average height for weight, height for chest circumference (xiphoid level), and height for bi-iliac hip width of the Newport children with the Iowa City children studied by Meredith and Boynton showed that the Newport and Iowa children were proportioned about the same but that the Newport children were smaller for their age.

THE McCLOY METHOD FOR DETERMINING NORMAL WEIGHT AND THE McCLOY WEIGHT, FAT, AND LIMB GIRTH INDICES

1. The McCloy weight standards, based on 8 physical measurements, were found very satisfactory for children of average build. They appeared somewhat high for overweight subjects and somewhat low for those who were extremely underweight.

2. High correlations were obtained between the McCloy weight and fat indices and estimates of nutrition made by the writer. Correlations between limb girth indices and nutrition estimates were low.

PHYSICAL CHANGES DURING ADOLESCENCE

1. The attainment of maturity in the Newport girls was accompanied by a gain in height of about 16 per cent from age 9. In the boys there was a similar percentage gain from age 11.

Dental examinations of the Newport children, made each fall for the four years (1936-40), showed the following:

1. The average number of cavities in the deciduous teeth (for the four years) was 5. The fall 1936 average was slightly lower than that for Mars Hill, but similar to those for Jonesport and Monmouth.

2. The average number of cavities in the permanent teeth (for the four years) was 4.8. The Newport average for fall 1936 was somewhat lower than those for the other three towns in 1934, but the differences may have been partly due to the difference in examiners.

3. Very few fillings were found in the deciduous teeth, the four-year average being only .42.

4. The average number of fillings in the permanent teeth (for the four years) was 1.28. This average is low in proportion to the number of cavities.

5. The permanent teeth most frequently extracted in the Newport children were the six-year molars. The four-year average for all permanent teeth extracted was .19.

6. In Newport 91.2 per cent of the children had one or more carious, filled, or extracted six-year molars. This figure is somewhat higher than those secured in the other three Maine towns.

7. More children with no caries, fillings, or extractions were found in Newport than in any of the other three towns, the four-year average being 3.6 per cent.

8. Irregular occlusion was the most common type of mal-occlusion seen in all four towns, but upper protrusion was also very common.

9. Only 2.7 per cent of the Newport children showed hypoplastic enamel in either their deciduous or permanent teeth.

10. In the Newport children gum inflammation was seen more frequently in the spring than in the fall. The fall and spring group averages for the last three years of the study were 11.8 and 24.4 per cent.

11. Six-hour vitamin C saturation tests and curative tests showed that in the majority of the children gum inflammation was related to vitamin C deficiency.

Home visits in Newport were made in the late fall and early winter of 1937. Data were secured regarding the family history, home conditions, and early history of the children as well as their diets and health habits at the time of the visits.

1. Fresh milk consumption in Newport was only a little more than half of that which is considered desirable for good nutrition. The average consumption per person in families with cows was .67 quart; in families without cows it was .37 quart. The average milk consumption of Newport families without cows was similar to the Monmouth average and somewhat higher than the Mars Hill and Jonesport averages.

2. Approximately 80 per cent of the Newport families had gardens but only 16 per cent had chickens. Newport was lower than Mars Hill or Monmouth in the percentage of families having gardens and lower than any of the other three towns in the percentage having chickens.

3. Apples were the chief fruit, exclusive of berries, raised in the four towns where surveys were made. In Monmouth a considerable number of families also raised pears, plums, cherries, and grapes.

4. Berries were the kind of fruit canned by the most families in all four towns.

5. The vegetables canned by the most families were string beans, pickles, greens, beets, and peas. Only about 9 per cent of the Jonesport families and 32 per cent of the Mars Hill families canned tomatoes. They were more frequently canned in the other two towns.

6. The quantities of fruits and vegetables canned by the majority of housewives were not sufficient to supply their families throughout the winter.

7. Apples, beets, cabbage, carrots, potatoes, rutabagas, and squash were the chief foods stored in all four towns.

8. Approximately three-fourths of the diets of the mothers in all towns were probably inadequate during pregnancy. Lack of sufficient milk and vitamin D were the most evident dietary deficiencies.

9. Approximately one-third of the Newport children were breast fed 5 months or more. There were more breast fed babies in the other towns.

10. During their first year somewhat less than two-thirds of the children in all four towns had orange juice, tomato juice, or both. Between 17 per cent (Jonesport) and 39 per cent (Newport) had cod liver oil. More of the Newport babies received eggs and vegetables than those in the other towns.

11. For preschool children in the four towns the averages for milk consumption were between two-thirds and three-fourths of the standard (1 quart). About one-fifth of the Newport children had cod liver oil, but the numbers were lower in the other towns.

12. At the time of the Newport home visits the diets of many of the children were low in milk, citrus fruits and tomatoes, green and yellow vegetables, other vegetables, and eggs. They tended to be high in refined carbohydrates (sugar and white flour) and low in calcium, iron, and vitamins A, B₁, riboflavin, niacin, C, and D. The dietary deficiencies in the other towns were similar to those in Newport.

Diet records kept by the Newport and Mars Hill children showed the same types of deficiencies which were indicated at the time of the home visits.

CONCLUSIONS

Efforts toward improving the nutritive condition of Maine people should be directed toward increasing food production and preservation and toward education in the choice of adequate diets. Special emphasis should be given to the importance of the increased use of milk, fruits, and vegetables (especially those high in vitamins A and C), eggs, and whole grain products. Also the importance of vitamin D (and milk), especially for women during pregnancy and lactation and for infants and children, should receive the special attention of parents, teachers, dentists, and physicians.

REFERENCES

- Aaron, H.
1938. Our common ailment. Dodge Publishing Co., New York.
- Becks, H., Jensen, A. L., and Millar, C. B.
1944. Rampant dental caries: prevention and prognosis. A five-year clinical survey. *J. Dent. Res.*, 23: 210-211.
- Bibby, B. G.
1942. Preliminary report on the use of sodium fluoride applications in caries prophylaxis. *J. Dent. Res.*, 21: 314.
- Bowes, A. deP., and Church, C. F.
1939. Food values of portions commonly used. Philadelphia Child Health Soc., Philadelphia.
- Boyd, J. D.
1942. Nutrition as it affects tooth decay. *J. Am. Diet. Assoc.*, 18: 211-215.
-
1944. Dental caries as influenced by fat versus carbohydrate in the diet. *Am. J. Dis. Child.*, 67: 278-281.
- Boynton, B.
1936. The physical growth of girls. A study of the rhythm of physical growth from anthropometric measurements on girls between birth and eighteen years. Univ. of Iowa Studies in Child Welfare, Vol. 12, No. 4. New Series No. 235.

Brucker, M.

1943. Studies on the incidence and cause of dental defects in children. II. Hypoplasia, *J. Dent. Res.*, 22: 115-121.

Chaney, M. S., and Ahlborn, M.

1939. Nutrition. Houghton Mifflin Co., Boston.

Chestler, A., Homburger, E., and Himwich, H. E.

1944. Carbohydrate metabolism in vitamin B₁ deficiency. *J. Biol. Chem.*, 153: 219-225.

Cheyne, V. D., and Rice, T. B.

1942. Effects of topically applied fluorine on human dental caries. *J. Dent. Res.*, 21: 320.

Clayton, M. M.

1940. The food habits and physical condition of children in selected communities in Maine. *Maine Agr. Expt. Sta. (Orono, Me.) Bul.* 401.

-
1942. A study of the McCloy method for determining normal weight. *Child Devel.*, 13: 215-226.

_____ and Folsom, M. T.

1940. A method for the study of the availability for human nutrition of the vitamin C in foods, with an application to the study of the potato. *J. Home Econ.*, 32: 390-395.

Clouse, R. C.

1943. Compilation of recent data on mineral and vitamin values in foods. *J. Am. Diet. Assoc.*, 19: 496-504 and 746-755.

Collins, S. D., and Clark, T.

1929. Physical measurements of boys and girls of native white race stock (third generation born) in the United States. *Physical Measurements Studies No. 1*. Reprint No. 1281 from *Pub. Health Rep.*, 44 (No. 18).

Committee on Food Composition of the Food and Nutrition Board. National Research Council.

1944. Tables of food composition giving proximate, mineral and vitamin components of foods. Office of Distribution, War Food Admin. and Pub. Health Service, Washington.

Council on Foods, American Medical Association.

1937. Sugars for use in infant feeding. *J. Am. Med. Assoc.*, 108: 1890.

Crane, M. M., and Woods, P. W.

1941. A study of vitamin C nutrition in a group of school children. 1. Clinical and laboratory studies. *New Eng. J. Med.*, 224: 503-509.

Curran, K. M., Tressler, D. K., and King, C. G.

1937. Losses of vitamin C during cooking of Northern Spy apples. *Food Res.*, 2: 549-557.

Dean, H. T., Jay, P., Arnold, F. A., and Elvove, E.

1941. Domestic water and dental caries. II. A study of 2832 white children, aged 12-14 years, of 8 suburban Chicago communities,

including *Lactobacillus acidophilus* studies of 1761 children. Pub. Health Rep., 56:761-792.

Dearborn, W. F., Rothney, J. W. M., and Shuttleworth, F. K.

1938. Data on the growth of public school children. (From the materials of the Harvard Growth Study.) Monogr. Soc. Res. Child Devel., 3, No. 1.

Dove, W. F.

1934. A study of the causes of nutritional deficiency diseases in the livestock and inhabitants of Maine, with possible corrective methods secured from the utilization of Maine fishery products and the production of superior foods. Maine Agr. Expt. Sta. (Orono, Me.) Bul. 375.

Eliot, M. M., Souther, S. P., Anderson, B. G., and Arnim, S. S.

1934. A study of the teeth of a group of school children previously examined for rickets. Am. J. Dis. Child., 48:713-729.

Esselen, W. B., Lyons, M. E., and Fellers, C. R.

1942. The composition and nutritive value of potatoes with special emphasis on vitamin C. Mass. Agr. Expt. Sta. (Amherst, Mass.) Bull. 390.

Follis, R. H., Jackson, D., Eliot, M. M., and Park, E. A.

1943. Prevalence of rickets in children and between two and fourteen years of age. Am. J. Dis. Child., 66:1-11.

Gray, H., and Ayres, J. G.

1931. Growth in private school children. The University of Chicago Press, Chicago.

Griffith, J. P., and Mitchell, A. G.

1934. The diseases of infants and children. W. B. Saunders Co., Philadelphia. P. 1066.

Harris, L. J., and Abbasy, M. A.

1937. Nutrition surveys. A simplified procedure for the vitamin C urine test. Lancet, 233:1429.

Jeans, P. C., and Stearns, G.

1938. The human requirement of vitamin D. J. Am. Med. Assoc., 111:703-711.

Jones, H. E., and Bayley, N.

1941. The Berkeley growth study. Child Devel. 12:167-173.

Knutson, J. W., and Armstrong, W. D.

1943. The effect of topically applied sodium fluoride on dental caries experience. Pub. Health Rep., 58:1701-1715.

Koehne, M., Bunting, R. W., and Morrell, E.

1934. Control of dental caries in children. Am. J. Dis. Child., 48:6-29.

Kruse, H. D.

1942. The gingival manifestations of avitaminosis C with especial consideration of the detection of early changes by biomicroscopy. Milbank Memorial Fund Quart., 20:290-323.

- Macleod, G., and Taylor, C. M.
1944. *Rose's Foundations of Nutrition*. Fourth Ed. The Macmillan Co., New York.
- Marriott, W. McK.
1935. *Infant Nutrition*. C. V. Mosby Co., St. Louis.
- McBeath, E. C., and Zucker, T. F.
1938. The role of vitamin D in the control of dental caries in children. *J. Nut.*, 15: 547-564.
- McCall, J. O., and Krasnow, F.
1938. The influence of metabolism on teeth. *J. Pediatrics*, 13: 498-505.
- McCloy, C. H.
1936. Appraising physical status: the selection of measurements. *Univ. of Iowa Studies in Child Welfare*, Vol. 12, No. 2. New Series No. 319.
-
1938. Appraising physical status: methods and norms. *Univ. of Iowa Studies in Child Welfare*, Vol. 15, No. 2. New Series No. 356.
- Meredith, H. V.
1935. The rhythm of physical growth. A study of eighteen anthropometric measurements on Iowa City white males ranging in age between birth and eighteen years. *Univ. of Iowa Studies in Child Welfare*, Vol. 11, No. 3. New Series No. 292.
- Monroe, M. M., and Murphy, E. F.
1943. Ascorbic acid content of vegetables as influenced by processing. *Maine Agr. Expt. Sta. (Orono, Me.) Bul.* 420, p. 523.
- Murphy, E. F.
1941. A study of vitamin C nutrition in a group of school children. 2. Dietary evaluation. *J. Nut.*, 21: 527-539.
-
1942. The ascorbic acid content of different varieties of Maine-grown tomatoes and cabbages as influenced by locality, season, and stage of maturity. *J. Agr. Res.*, 64: 483-502; *Maine Agr. Expt. Sta. (Orono, Me.) Bul.* 411-F, p. 378.
-
- and Dove, W. F.
1943. Varietal differences in vitamin C content of food crops. *Maine Agr. Expt. Sta. (Orono, Me.) Bul.* 420, p. 521.
- Osgood, R. B.
1942. An important etiologic factor in so-called "foot strain." *New Eng. J. Med.*, 226: 552-557.
- Park, E. A.
1940. The therapy of rickets. *J. Am. Med. Assoc.*, 115: 370-379.
- Roberts, L. J.
1935. *Nutrition work with children*. Univ. of Chicago Press, Chicago.
- Robertson, E. C.
1937. Intestinal stasis due to low mineral intake. *Am. J. Dis. Child.*, 53: 500-509.

Ross, E.

1944. Effect of time and temperature of storage on vitamin C in canned citrus juices. *Food Res.*, 9: 27-33.

Sherman, H. C.

1929. The problem of sweets for children. Reprint from *Child Health Bul.* for May, 1929. *Am. Child Health Assoc.*

-
1941. *Chemistry of food and nutrition.* The Macmillan Co., New York.

Smith, M. C., Lantz, E. M., and Smith, H. V.

1931. The cause of mottled enamel, a defect of human teeth. *Arizona Agr. Expt. Sta. (Tucson, Ariz.) Tech. Bul.* 32.

Snedecor, G. W.

1940. *Statistical methods.* The Iowa State College Press, Ames, Iowa.

Stiebeling, H. K., and Clark, F.

1939. Planning for good nutrition. *Yearbook of Agriculture*, 321-340. U. S. Dept. of Agr., Washington.

Sullivan, C. L.

1944. Diet in pregnancy. *New Eng. J. Med.*, 230: 167-169.

Sweet, C.

1938. The teaching of body mechanics in pediatric practice. *J. Am. Med. Assoc.*, 110: 419-426.

_____, Watson, R. G., and Stafford, H. E.

1928. Physiologic changes in posture during the first six years of life. *J. Am. Med. Assoc.*, 91: 1519-1520.

Taylor, C. M.

1942. *Food values in shares and weights.* The Macmillan Co., New York.

Volker, J. F.

1943. Observations on the adsorption of fluorides by the enamel. *J. Dent. Res.*, 22: 201.

Whitacre, J.

1934. Dental decay among Texas school children. *Texas Agr. Expt. Sta. College Station, Brazos Co. Bul.* 491.

Wood, H. C., Jr., and Osol, A.

1943. *U. S. Dispensatory.* J. B. Lippincott Co., Philadelphia.

Wolf, J.

1942. Vitamin C content of German apples. *Gartenbauwissenschaft*, 16: 292-313; *Nut. Abs. and Rev.*, 13: 60, 1943.

APPENDIX

[illegible]

Form 1 Reverse Side

MEASUREMENTS

SUMMARY

Date	
Age	
Height	
Weight	
Girth chest	
Girth, upper arm	
Girth, forearm	
Girth, thigh	
Girth, calf	
Hip width—iliac	
Hip width—trochanteric	
Elbow width	
Knee width	
Far chest front	
Fat abdomen	
Fat chest back	
Fat suprailiac	
Total fat	
Hip difference	
Breathing capacity	
Pubescence	
Weight index	
Limb girth index	
Fat index	
Breathing capacity index	
Index of build	
Haemoglobin	

KEY TO PHYSICAL EXAMINATIONS

Use check mark for good or normal wherever possible and indicate deviations by descriptive words.

General appearance: Good, fair, poor.

Bone development: Indicate any marked deviation from the normal size of skeleton.

Cranium: Normal, bosses (parietal or frontal), other abnormalities.

Spine: Normal, kyphosis, lordosis, scoliosis.

Chest: Normal, flat, pigeon, funnel, beading of ribs, Harrison's groove.

Joints: Normal, limber, stiff, deformities.

Epiphyses: Normal, enlarged.

Feet: Normal, flat, pronation, talipes, etc.

Legs: Normal, bowing, knockknees.

Posture: Good, fair, poor. (For details refer to bone development.)

Nutrition:

Turgor: Good, fair, poor.

Muscle development: Good, fair, poor.

Subcutaneous tissue: Abundant, average, scant.

Skin:

Color: Fair, medium, dark. Clear, sallow, pale.

Texture: Rough, smooth, dry, oily.

Lesions: State type.

Mucous membranes: Normal, pale, scars, ulcers.

Scalp: Clean, dirty, scaling, dry, oily, pediculi.

Hair: Normal, oily, dry.

Nails: Normal, brittle, tough, ridged, scarred, spotted, nail biting.

Eyes:

Vision: Right 20/ ; left 20/ . Indicate if child wears glasses.

Pupils: Regular, irregular.

Reaction to light and accommodation: Normal, abnormal (describe).

Musculature: Normal, strabismus (internal or external).

Conjunctiva: Clear, injected, discharge, scars.

Lids: Normal, styes, granulations.

Ears:

Hearing.

Discharge.

Drums: Right

Left

Nose:

Obstruction. Indicate if present.

Discharge: Slight, moderate, profuse. Indicate if child has an acute cold.

Mouth breathing. Indicate if present.

" " apparently caused by adenoids.

Mouth:

Hygiene: Good, fair, poor, very poor.

Teeth: (See Form 2, Appendix, for form used in detailed dental examinations.)

Form: Normal, grooved, peg-shaped, enamel defects.

Caries, temp.: Number and description.

Caries, perm.: Number and description.

Missing, temp.: Number.

Missing, perm.: Number.

Approximation: Good, fair, poor.

Six-year molars: Describe condition.

Gums: Normal, spongy, injected, ulcerated.

Glands:

Tonsils: Normal, enlarged +, ++, +++, +++++, removed.

Adenoids (hypertrophied tissue): Present, removed.

Thyroid: Normal, enlarged.

Anterior cervical: If enlarged describe.

Posterior cervical: If enlarged describe.

Other: Indicate and describe.

Heart: Normal; if abnormal describe as to rhythm, murmurs, etc.

Lungs: Normal; if abnormal describe.

Abdomen:

Masses: Normal; if abnormal describe.

Hernia: If present indicate type.

Genitalia: Normal; if abnormal describe.

Cooperation: Good, fair, poor.

Vaccination scar: Check if present.

General condition: Good, fair, poor.

Remarks: Note here if mentality seems to be below average.

Form 2
Form 424

STATE DEPARTMENT OF HEALTH AND WELFARE
BUREAU OF HEALTH
DIVISION OF DENTAL HYGIENE
AUGUSTA, MAINE

(Name of Child)

(Sex)

(Birth Date)

(Name of Parent or Guardian)

(Address of Parent or Guardian)

DA—Decalcified areas S—Superficial caries U—Deep caries R—Retained caries
AR—Abscess F—Filling NR—Retained roots G—Gingivitis X—Extracted FS—Fissure on *jet*

[illegible]

(Over)

Form 2, Reverse Side						
Date of Examination						
6. Habits						
Thumb sucking						
Finger sucking						
Mouth breathing						
Lip biting						
Tongue biting						
Cheek biting						
Resting on hand						
Sleeping on hand						
Pacifier						
7. Mucous membrane						
8. Gum Tissue						
9. Anomalies						
0: Did prophylaxis precede examination?						
1. Temperament						
Phlegmatic						
Normal						
Nervous						
Remarks:						
Name of Examiner						

Directions: Make all records with ink. Locate defect on tooth draw line to side and write symbol, adding number of examination, as—DA 1. Use check mark on items Nos. 1, 2, 3, 4, 5, 6, 7 and 11: write descriptive term in space opposite other items.

Form 3

MAINE AGRICULTURAL EXPERIMENT STATION

Home Economics Project No. 5

Home Visit

Name	Birth date	Date of visit
Address	Newport school	Grade

MEMBERS OF HOUSEHOLD	Name	Nationality	Age	Employment	Health*
Immediate family					
Father					
Mother					
Children (l.&d.)					

Other members

*If dead give cause,
age, and date

FAMILY HISTORY AND CONDITIONS IN THE HOME

Language spoken	Education of father	Mother
Type of house	Size	Care

FOOD PRODUCTION AND PRESERVATION FOR FAMILY USE

Cows	Other source of milk supply	Amount used daily
Vegetables raised or picked wild		

Fruits raised or picked wild

Hens	Young chickens	Animals for meat
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Canning

Storage

PRENATAL HISTORY

Pregnancy: Physical condition	Employed?
Diet: Adequate	Inadequate
Birth: Full term	Overtime
Difficult	Injuries or malformations
Weight	General condition at birth

HISTORY OF FIRST YEAR

Basic feeding: Breast	Duration	Mixed	Duration
Bottle	Duration	Kinds	
Age at weaning		Month begun	

Supplements: Orange juice
Tomato juice
Cod liver oil
Egg yolk
Vegetable pulp
Fruit pulp
Cereal
Meat broth
Other

Feeding problems

Health	Illnesses	Regular gain
Dentition: Age of first tooth	Regular	Retarded

Form 3, Reverse Side

SCHOOL HISTORY

Diet: Were any foods particularly disliked? _____
 Did any foods disagree? _____
 Were any other foods withheld? _____
 Amt. milk per day _____ Cod liver oil _____ Many sweets? _____
 Health _____ Illnesses _____
 Appetite: Good _____ Fair _____ Poor _____ Regular gain? _____

PRESENT FOOD AND HEALTH HABITS

Meals preceding day
 Breakfast _____ Noon meal _____ Night meal _____ Between meals _____

Usual meals
 Breakfast _____ Noon meal _____ Night meal _____ Between meals _____

Appetite: Good _____ Fair _____ Poor _____ Are breakfasts well eaten? _____
 Have child's eating habits changed since he started to school? _____
 Cooked veg. besides pot. eaten most _____
 Tomatoes, how often? _____
 Raw veg., how often? _____ Kinds _____
 Fruits eaten most _____
 Cakes or grapef. how often? _____
 Meat, how often? _____ Fish _____ Eggs _____
 Cereals eaten most _____
 Milk breads how often? _____ Kinds _____
 Favorite desserts _____ Candy, how often? _____
 St. milk _____ Cocoa _____ Coffee _____ Tea _____
 Source of vit. D. _____ Seasons _____ Amt. daily _____

Health habits: What time does child go to bed? _____
 Regular about bed time? _____ What time does he get up? _____
 Lessons besides school work? _____ What after school? _____

Accidents? _____ What? _____ How often? _____ Habits _____
 Infectious diseases _____ Severity _____ Age _____

Other prolonged illnesses

Recent illnesses _____
 Immunizations _____
 Injuries _____
 Operations _____
 Physical defects _____

Form 4

NEWPORT FOOD RECORD - 1940

Name

Age

Birthday

Grade

Parent's Name			
Day	Date 1940	Foods	Amounts
		Breakfasts	
		Dinner	
		Supper	
		Between meals	

TABLE 9

*Height of Maine Girls Included in This Study
Fall Averages for Four Towns Compared with U. S., Iowa, and
Gray's Averages*

Ages†	1936-1939 (incl.) Newport		1934-1936 (incl.) Mars Hill		1934 Jonesport		1934 Monmouth		4 Maine Towns	U. S.	Iowa	Gray's
	No.	Av.	No.	Av.	No.	Av.	No.	Av.	Av.	Av.	Av.	Av.
		in.		in.		in.		in.	in.	in.	in.	in.
5	27	43.5	13	42.2	6	43.2	2	41.9	42.7	—	42.3	43.7
6	57	43.9	31	44.8	15	43.3	9	45.1	44.3	44.8	44.8	46.5
7	57	46.2	45	46.1	12	44.8	11	46.3	45.9	46.7	47.6	48.9
8	54	48.5	51	48.2	20	48.2	7	46.2	47.8	48.9	49.9	51.5
9	62	50.6	50	50.4	10	51.0	12	50.3	50.6	50.9	52.2	53.5
10	53	52.7	38	52.7	12	52.7	13	53.0	52.8	52.9	54.2	55.2
11	53	55.2	51	54.7	14	53.6	8	53.0	54.1	55.2	56.5	57.5
12	57	57.7	44	57.4	17	55.4	8	57.9	57.1	57.5	59.2	59.9
13	42	60.0	32	59.3	10	58.9	5	58.1	59.1	59.9	61.4	61.9
14	19	61.5	19	60.5	5	59.3	10	61.6	60.7	61.2	62.8	63.0

† To nearest birthday.

TABLE 10

*Height of Maine Boys Included in This Study
Fall Averages for Four Towns Compared with U. S., Iowa, and
Gray's Averages*

Ages†	1936-1939 (incl.) Newport		1934-1936 (incl.) Mars Hill		1934 Jonesport		1934 Monmouth		4 Maine Towns	U. S.	Iowa	Gray's
	No.	Av.	No.	Av.	No.	Av.	No.	Av.	Av.	Av.	Av.	Av.
		in.		in.		in.		in.	in.	in.	in.	in.
5	16	43.0	8	43.1	7	41.8	2	41.6	42.4	—	43.3	43.8
6	48	45.0	27	45.1	14	45.1	13	44.5	44.9	45.2	45.5	46.7
7	46	47.3	31	47.2	9	47.0	10	47.1	47.2	47.0	48.0	49.1
8	50	49.6	37	49.1	14	49.6	9	48.2	49.1	49.3	50.4	51.6
9	51	51.4	35	51.3	17	50.8	5	52.0	51.4	51.3	52.6	53.5
10	53	53.1	40	52.8	12	52.3	15	53.9	53.0	53.2	54.7	55.6
11	62	54.9	29	54.7	15	54.9	16	53.9	54.6	55.1	56.4	57.3
12	64	57.0	29	57.3	11	55.5	17	56.2	56.5	56.8	58.2	59.2
13	46	59.5	21	59.0	13	57.6	18	59.2	58.8	59.1	60.4	61.6
14	28	61.1	15	62.3	10	59.0	8	60.3	60.7	61.2	62.8	63.9
15	10	63.9	7	64.0	5	61.5	8	62.2	62.9	62.6	65.0	66.3

† To nearest birthday.

TABLE 15

*Weight of Maine Girls Included in This Study
Fall Averages for Four Towns Compared with U. S., Iowa, and
Gray's Averages*

Age†	1936-1939 (incl.) Newport		1934-1936 (incl.) Mars Hill		1934 Jonesport		1934 Monmouth		4 Maine Towns	U. S.	Iowa	Gray's
	No.	Av.	No.	Av.	No.	Av.	No.	Av.	Av.	Av.	Av.	Av.
		lb.		lb.		lb.		lb.	lb.	lb.	lb.	lb.
5	27	37.9	13	39.5	6	40.5	2	39.6	39.4	—	39.3	43.0
6	57	40.8	31	43.6	15	41.7	9	44.7	42.7	43.9	44.1	49.3
7	57	45.6	45	45.9	12	43.1	11	48.7	45.8	47.6	50.4	55.3
8	54	49.6	51	52.0	20	51.9	7	47.7	50.3	52.4	53.4	61.4
9	62	55.9	50	56.5	10	56.8	12	61.3	57.4	58.1	62.6	69.9
10	53	60.6	38	65.4	12	61.5	13	70.6	64.5	64.2	69.6	77.4
11	53	71.1	51	71.4	14	65.0	8	62.7	67.6	72.8	78.8	83.1
12	57	81.2	44	83.5	17	71.0	8	83.2	79.7	81.8	89.5	96.1
13	42	93.1	32	92.2	10	85.3	5	101.3	93.0	92.6	100.1	105.4
14	19	100.0	19	95.1	5	95.7	10	103.4	98.6	101.0	110.7	111.6

† To nearest birthday.

TABLE 16

*Weight of Maine Boys Included in This Study
Fall Averages for Four Towns Compared with U. S., Iowa, and
Gray's Averages*

Age†	1936-1939 (incl.) Newport		1934-1936 (incl.) Mars Hill		1934 Jonesport		1934 Monmouth		4 Maine Towns	U. S.	Iowa	Gray's
	No.	Av.	No.	Av.	No.	Av.	No.	Av.	Av.	Av.	Av.	Av.
		lb.		lb.		lb.		lb.	lb.	lb.	lb.	lb.
5	16	40.4	8	40.3	7	36.9	2	43.0	40.2	—	41.8	43.2
6	48	44.7	27	45.5	14	46.1	13	42.8	44.8	44.6	46.0	48.9
7	46	49.9	31	49.1	9	50.0	10	51.1	50.0	48.5	51.7	54.2
8	50	54.7	37	52.4	14	56.5	9	51.3	53.7	54.0	58.0	61.4
9	51	59.0	35	58.9	17	59.0	5	61.9	59.7	59.0	63.8	68.0
10	53	65.1	39	63.3	12	62.5	15	69.5	65.1	65.1	71.6	75.8
11	62	70.0	29	63.9	15	70.4	16	70.5	69.5	71.6	77.6	82.8
12	64	77.9	29	77.3	11	75.8	17	78.2	77.3	78.3	85.1	89.5
13	46	89.0	21	84.0	13	88.7	18	92.2	88.5	87.0	96.0	98.5
14	28	96.9	15	95.6	10	89.7	8	93.4	93.2	97.2	107.0	108.6
15	10	105.3	7	103.2	5	102.4	8	95.7	101.7	101.8	120.9	123.2

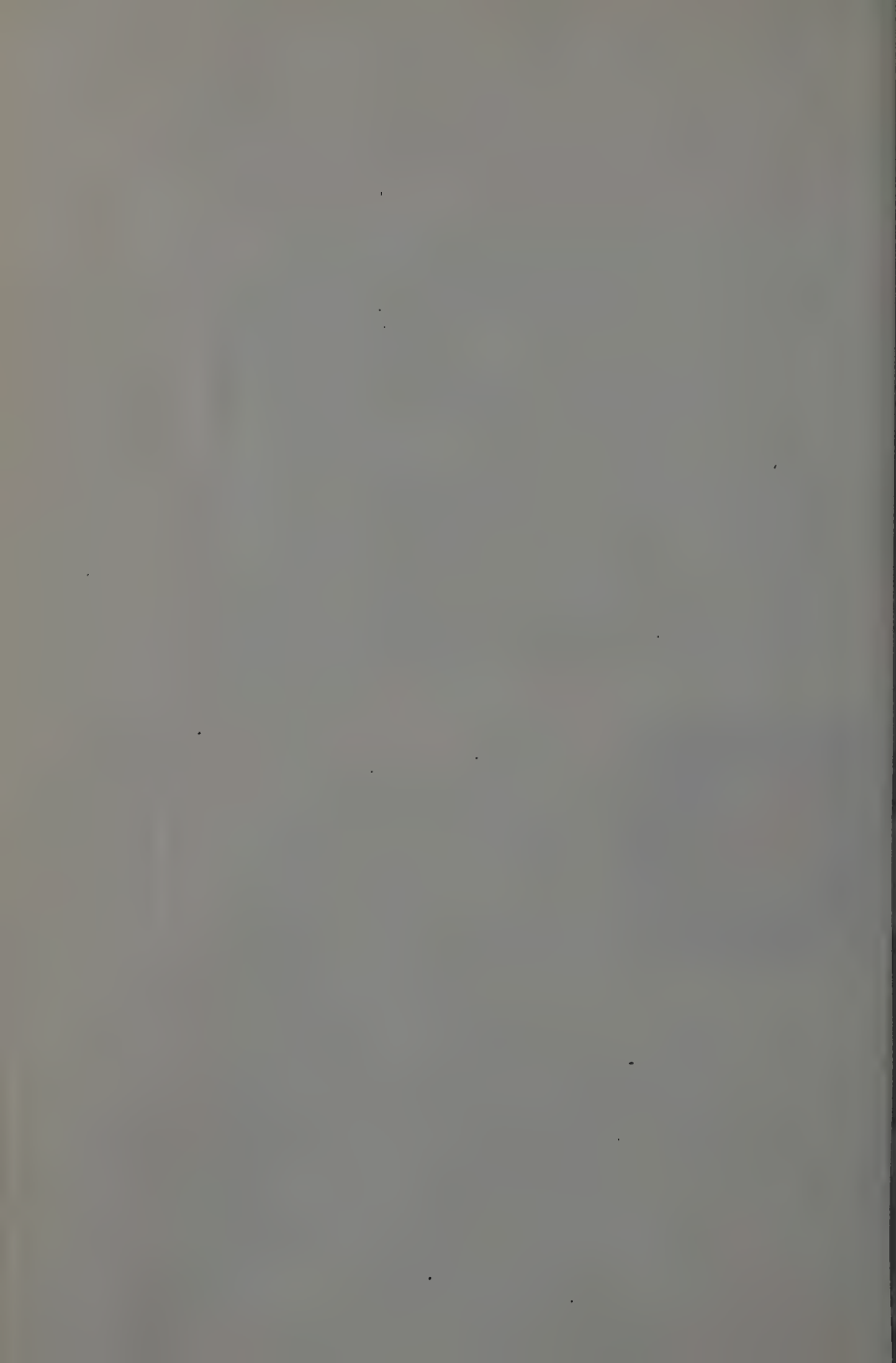
† To nearest birthday.

TABLE 17

*Average Measurements of Newport, Maine Girls and Boys
Used in Charts 5 and 6*

Ages*	Height		Weight		Chest circumference (xiphoid level)		Bi-iliac hip width	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
	in.	in.	lb.	lb.	in.	in.	in.	in.
6	43.8	44.9	41.1	45.0	21.1	22.1	7.2	7.4
7	46.1	47.5	45.0	49.5	21.6	22.7	7.5	7.7
8	48.4	49.6	50.5	54.8	22.4	23.4	7.9	8.0
9	50.4	51.3	56.0	59.1	23.1	23.8	8.1	8.2
10	52.5	52.9	61.5	64.0	23.7	24.6	8.4	8.5
11	55.2	55.0	71.0	70.8	24.7	25.3	8.9	8.8
12	57.9	56.7	84.1	76.9	25.7	26.0	9.4	9.0
13	60.1	59.7	92.2	90.5	26.7	27.5	9.9	9.6
14	61.3	61.6	101.0	102.3	27.0	28.3	10.3	9.8

* To nearest birthday. In most cases two measurements were made in one year. That one was used which was nearest to the child's birthday.



BULLETIN 431

THE MEXICAN BEAN BEETLE IN MAINE

JOHN H. HAWKINS

Since the Mexican bean beetle is established in all the important bean growing areas of Maine, its recognition and control are important in the production of beans needed as wartime food, and in limiting spread and increasingly greater injury to future bean crops. This bulletin is written with the intent of giving immediate help to those seeking help in problems of recognition and control of the Mexican bean beetle. It is not a detailed report and applies only to conditions as they exist in Maine. Work on the problem is being continued and more extensive and technical reports are planned for future publications.

ORIGIN AND SPREAD

The Mexican bean beetle probably originated in Mexico. It was reported from southwestern United States in 1864, Douglass, (1933).¹ From there the spread eastward has been gradual and it was 1930 when it was found in southwestern Maine. Now it is present in all the principal bean growing areas of the State.

IMPORTANCE

The Mexican bean beetle is the most destructive insect affecting beans in Maine. The bean crop as a whole is never entirely free from infestation. Sometimes a large portion of the bean crop is severely injured and there remains the possibility that this pest may become an even greater menace to the bean crop of the State. As it now stands losses of several thousands of dollars annually are caused by this insect to the bean crop of Maine.

¹ See list of literature cited.

THE MEXICAN BEAN BEETLE AND OTHER LADYBIRD BEETLES

The Mexican bean beetle belongs to the ladybird beetle family Coccinellidae. Many of the ladybird beetles are beneficial and destroy large numbers of injurious insects, especially aphids which feed on our field, garden, and orchard crops. The only ladybird beetle known to be injurious to crops in Maine is the Mexican bean beetle which can be distinguished by the form of the body, the arrangement of spots on the wing covers and by the type of injury caused to bean plants (Figs. 8, 9, and 10).

DESCRIPTION OF THE MEXICAN BEAN BEETLE

There is some variation in the size of the adult Mexican bean beetle but the length is usually a little more than $\frac{1}{4}$ of an inch and the width is about $\frac{3}{4}$ that of the length. In shape and size the beetles are about equal to half of a large pea, being rounded above and flattened below (Figs. 1, 2, 3, and 4). The general color is yellowish for newly emerged beetles and coppery bronze for the older ones. The hard elytra or outer wing covers protect the thin inner wings folded beneath, which are unfolded and spread out when the beetles fly. Black spots, roughly round in outline, are arranged in three rows across the wing covers (Fig. 4). The first row back of the head consists of a series of six spots arranged in a zigzag pattern across the beetle's back. The next or middle row of six spots is arranged more nearly in a straight line and the last row of four spots is arranged roughly to form a crescent. These 16 spots differ in their arrangement from that of any of the beneficial ladybird beetles found in Maine. The downward thrust head (a, Fig. 1) and the two eyes which appear as small black spots can be seen by looking closely at the front of the head. The mouth appendages, including the cutting jaws, or mandibles (Mb, Fig. 2), can be seen at the underside of the head only by close examination or through magnification. On the upper side of the body between the head and wing covers is the yellowish thoracic shield (b, Fig. 2). The yellowish color, the lack of spots or markings on the thoracic shield, and the 16 spots and their arrangement on the wing covers are characteristic of the Mexican bean beetle and serve to separate

it from our common large 15 spotted beneficial ladybird beetle for which the Mexican bean beetle is sometimes mistaken.



FIG. 1



FIG. 2

FIG. 1. Lateral view of the Mexican bean beetle. A. Head. B. Thoracic shield. C. Elytra or wing covers. (Actual length about $\frac{1}{4}$ inch.)

FIG. 2. Front view of the Mexican bean beetle, enlarged. Actual width of the beetle about $\frac{3}{16}$ of an inch. A. Head. B. Thoracic shield. C. Elytra or wing covers. Mb. Mandibles or jaws.



FIG. 3. Mexican bean beetles on under side of a bean leaf. Slightly enlarged. Actual size of the beetles about $\frac{1}{4}$ inch in length.

EGGS OF THE MEXICAN BEAN BEETLE

Eggs of the Mexican bean beetle (Fig. 5) are elongate oval in shape, yellowish in color, about $\frac{1}{20}$ of an inch in length, and they are about $\frac{1}{2}$ as wide as they are long. Eggs are laid in groups of



FIG. 4. The Mexican bean beetle from above, enlarged. The actual size being about $\frac{1}{4}$ inch in length. A. Head. B. Thoracic shield. C. Wing covers or elytra.

45 or 50 and are attached by one end to the underneath side of the bean leaf.



FIG. 5. Eggs of the Mexican bean beetle seen from above, attached to under side of a bean leaf. Slightly enlarged from natural size of about $\frac{1}{20}$ inch in length. (Photographed by Dr. E. C. Ogden.)

LARVAE OF THE MEXICAN BEAN BEETLE

The larvae of the Mexican bean beetle are quite small when first hatched but often attain a length of $\frac{1}{3}$ of an inch when fully



FIG. 6. Two larvae and a pupa of the Mexican bean beetle.
About natural size.

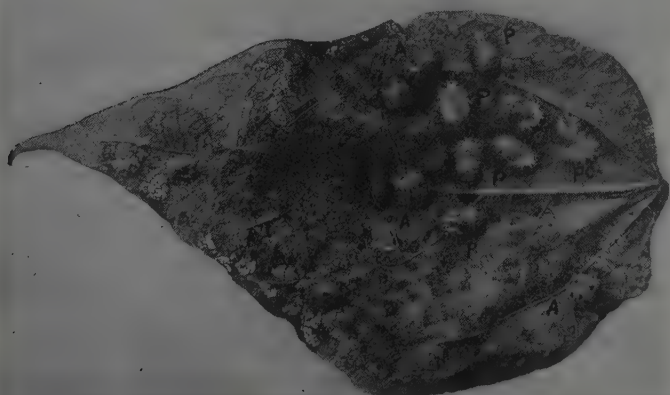


FIG. 7. Pupae of Mexican bean beetle, (P), empty pupal skins from which the beetles have emerged, (PC), and 3 adult beetles, (A).

mature (Fig. 6). The young larvae appear to be quite black in color due to the many black branched spines which cover all but the head and ventral or lower portion of the body. In the older larvae the spines are pale and the yellowish color predominates.

PUPAE OF THE MEXICAN BEAN BEETLE

Pupae of the Mexican bean beetle (Fig. 7) are attached by the last larval skin to the undersides of the bean leaves. They are yellowish in color, are a little more robust, and otherwise about the same size and shape as the beetles. The greyish cast skins, the bright yellowish bodies, and their lack of activity serve to identify pupae.

BIOLOGY AND LIFE HISTORY OF THE MEXICAN BEAN BEETLE

When the weather is warm early in the season it enables the Mexican bean beetle to break its hibernation period and the beetles appear on early planted beans about the first of June. An early spring combined with a late fall and warm weather prolongs the season of injury by the larvae and adults. It was during such a season in 1942 that the Mexican bean beetle caused the most extensive injury to beans ever recorded for central Maine.

When snow coverage is ample, the beetles are relatively safe in their hibernating quarters beneath the snow and surface debris, temperatures at this level being several degrees above and more constant than that of the surrounding air. It is, therefore, entirely possible that Mexican bean beetles, hibernating beneath the snow here, are less subject to low and changing temperatures than they are farther south where the soil is often bare during the winter months. Ample snow coverage is probably one reason why the Mexican bean beetle has been able to increase in this area during the last decade.

Mexican bean beetles can successfully hibernate only as adults. They are said to prefer a mixed oak and pine environment in other sections of the country, Howard (1936), where they seek cover for the winter beneath a blanket of debris of pine needles and oak leaves. Under climatic conditions of Maine many of

the beetles fail to reach a forest environment and when overtaken by cold weather find refuge beneath bean stacks and other refuse in the fields. Regardless of where they hibernate, the adult beetles have been known to appear in central Maine early in June when the weather was warm and about 10 to 14 days later when the weather was cooler. The beetles are able to fly considerable distances, consequently beans several miles distant from the winter quarters may be infested. June 2 is the earliest date of injury by the Mexican bean beetle recorded for central Maine.

Since the beetles arrive intermittently in bean plantings the adult beetles, eggs, and larvae are all present during the greater part of the summer season. Eggs are laid shortly after the first appearance of the beetles which is sometimes as early as the first week in June. The eggs hatch in less than two weeks. The young or larvae reach their maturity by four successive steps, or instars, after each of which they shed their skins. The larval stage of the Mexican bean beetles is the stage in which much active feeding occurs and during which most of the damage is done to beans. The larvae feed for about three weeks after which they molt and change to pupae.

The inactive resting or pupal stage (Fig. 7) occurs at the end of the larval stage, and occupies about 20 days during which the transformation from larva to adult takes place. At the end of the pupal stage the beetles emerge, feed a while and either mate and lay eggs for a late summer generation or spread for winter hibernation. During 1943 the late summer generation eggs were laid about the first of September. Eggs are laid from early June until freezing weather and from eggs to adult requires a total time period of about 40 days during average Maine summer temperatures, the time varying with weather conditions and, in general, the life history is shorter coincident with high temperatures. When there is a late summer generation of larvae, a few are able to reach the beetle stage, but a great many never get beyond the pupal stage, are caught by freezing weather and perish. The old coppery bronze beetles of the previous hibernating winter die before the first of September so that the current new summer generation of freshly emerged bright yellowish beetles are easy to distinguish as the hibernating, overwintering generation.

INJURY CAUSED TO BEANS BY ADULT MEXICAN BEAN BEETLES

When warm weather comes early, adult Mexican bean beetles break hibernation and are ready to start feeding on beans soon after the plants come up. Attack by the beetles early in June before the young bean plants have become well established may seriously affect the stand. Injury to the bean plants caused by the adults results in a lace-like appearance to the foliage in which large holes appear (Figs. 8 and 9). Early infestations result in the early laying of eggs from which larvae will hatch and continue the destruction started by the adults.



FIG. 8. Bean plants injured by larvae and adults of the Mexican bean beetle showing the leaves from which the green portions have been eaten giving the plants their lace-like appearance.



FIG. 9. Bean plant showing how individual bean plants are injured by adults and larvae of the Mexican bean beetle. Few pods are formed on the plant and those formed do not yield normal sized beans.

INJURY CAUSED BY LARVAE OF THE MEXICAN BEAN BEETLE

Larval feeding by the Mexican bean beetle begins about two weeks after the first appearance of the adult beetles and

before the beetles have ceased feeding. The larvae feed on the underneath sides of the leaves. The tissue is eaten away in parallel strips separated by narrow, irregular lines of uneaten tissue and the thin upper layer of the upper epidermis is left

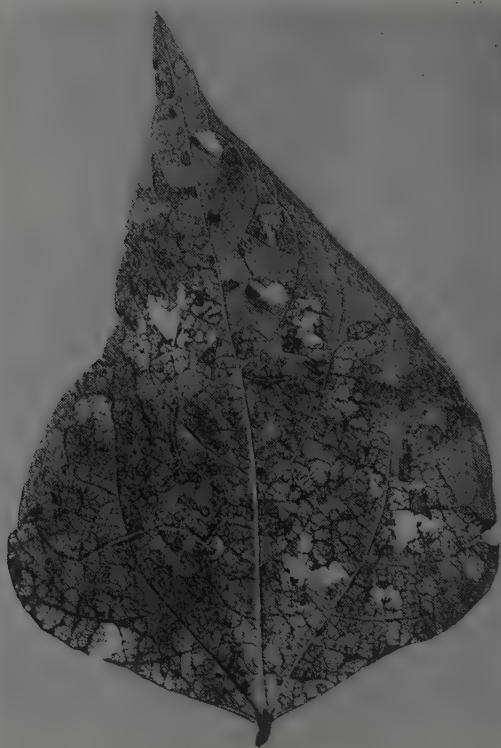


FIG. 10. Under side of bean leaf showing how the larvae of the Mexican bean beetle eat away most of the green portions of the leaf leaving narrow parallel strips of the green portion separating the transparent epidermis. In case of severe injury the leaves deteriorate and the bean plants are denuded of foliage.

nearly intact (Fig. 10). Badly injured plants do not develop fully and the bean yield is often seriously affected. The larvae are responsible for the greater portion of the injury caused by the insect to the beans during the period of July to October.

HOST PLANTS

The Mexican bean beetles feed upon several kinds of beans and some wild host plants. The common bush variety of garden and canning beans, pole beans, kidney beans, field beans such as the yellow eye and pea beans, and lima beans grown in Maine are all subject to injury. Observations show that the runner or semi-runner type of field beans and pole beans offer conditions especially favorable to infestation by the beetles and their larvae. Bush types of beans are also injured and because they are the predominant type of beans grown in the gardens and fields of the State, extensive injury is done to them by the Mexican bean beetle. The beggarweed or beggar-tick (*Meibomia* sp.) and the soybean although not reported as hosts in Maine are infested by the Mexican bean beetle in other states.

EFFECT OF HEAVY FOLIAGE AND SPACING OF BEAN PLANTS

In general the heavier the foliage the more likely conditions are to be favorable to habitation by Mexican bean beetles and their larvae. Heavy bean foliage is difficult to treat when it becomes necessary to apply insecticides to the bean plants.

It was found that a 3-inch interval was a good planting distance for beans, Burgess and Bailey (1938) and Burgess (1941). Turner and Friend (1935) found that sprayed bean plants were injured less by the Mexican bean beetle as the space between plants was increased and that there was only $\frac{1}{2}$ the rate of reduction in yield when the beans were planted 6 to 8 inches apart than when the spacing was 2 inches. The same authors found that there were twice as many eggs of the Mexican bean beetle present on 100 bean plants spaced 2 inches apart as there were when the same number of plants were planted 8 inches apart. Probably the best spacing for beans where this insect is a factor

would be to plan to have the plants stand so that there were 3 or 4 to the foot or at 3- or 4-inch intervals.

INSECTICIDES FOR MEXICAN BEAN BEETLE CONTROL

Insecticides can be used effectively in control of the Mexican bean beetle. Insecticides should be purchased well ahead of the time when they are to be used and their choice made on the basis of their (1) cost, (2) effectiveness, (3) effect on the bean yield, (4) kind of machinery available for their application, and (5) with consideration for the safety of the ultimate consumer.

Three insecticidal materials used over a period of years in central Maine have proven satisfactory for Mexican bean beetle control. These materials are calcium arsenate, cryolite, and rotenone.

CALCIUM ARSENATE

Calcium arsenate is relatively inexpensive and under most conditions readily purchased from local insecticide dealers. Calcium arsenate is recommended especially for beans early in the season before the pods are set on the plants and for dry shelled beans or when the immature beans are removed from the pods to be canned, eaten or marketed as fresh shell beans. Where beans grown for canning have been protected from the time the first Mexican bean beetles appear until the pods are set on the plants, the control will be effective until the beans can be harvested. (See warning, p. 218.)

Calcium arsenate can be used with good results on beans *only when combined with magnesium hydrated spray lime* regardless of whether the material is to be applied in the form of a dust or a spray.² Since magnesium lime may not be stocked by local stores arrangements for securing it should be made in advance of its use. Dust containing calcium arsenate and magnesium lime cannot be purchased ready mixed. Mixing can readily be done at home which insures a fresh supply of an effective insecticide. (County Agents, Extension Service or Experiment Station will furnish mixing directions for those desiring them.)

² Lime, approximately 30% magnesium expressed as magnesium oxide.

The following formulae are recommended:

DRY DUSTS

1. Calcium arsenate 1 part
Copper lime dust (to be made of monohydrated
copper sulfate 1 part and hydrated magnesium
spray lime 4 parts) 9 parts
2. Calcium arsenate 1 part
Hydrated magnesium spray lime 9 parts

Dusts 1 and 2 can be made up in any amounts as long as the above proportions are adhered to. (Dust mixtures containing monohydrated copper sulfate are likely to become extremely lumpy if held over from one season to another.)

WATER SPRAYS

3. Calcium arsenate 3 pounds
Copper sulfate (blue vitriol) 10 pounds
Hydrated magnesium spray lime 10 pounds
Water 100 gallons

For small amounts use:

- Calcium arsenate 3 level tablespoonfuls
Copper sulfate 9 level tablespoonfuls
Magnesium hydrated lime 9 level tablespoonfuls
Water 1 gallon
4. Calcium arsenate 3 pounds
Hydrated magnesium spray lime 3 pounds
Water 100 gallons

Or for small amounts

- Calcium arsenate 3 level tablespoonfuls
Hydrated magnesium spray lime 3 level tablespoonfuls
Water 1 gallon

Cryolite is effective in the control of the Mexican bean beetle. It is toxic to humans and domestic animals and it should be used with care (see warning, p. 218). Cryolite is now stocked by insecticide dealers in Maine and can be ordered through local dealers. It is used as follows:

DUST

5. Cryolite 1 part
Talc, clay, or flour 3 parts

SPRAY

6. Use according to directions on the package or
Cryolite 3 pounds
Water 100 gallons

Or for small amount
Cryolite 3 level tablespoonfuls
Water 1 gallon

Warning: Beans treated with calcium arsenate or cryolite after pods are formed on the plants should not be used as food unless it is certain that harmful residues have been removed. Bean refuse treated with insecticides should not be fed to livestock where there is danger of poisoning.

Lead arsenate or Paris green should not be applied to beans as their use is likely to result in a reduction in yield, and they are also poisonous to human beings.

ROTENONE

Rotenone is not injurious to humans or domestic animals when used according to directions. It is often used on beans when it is necessary to treat them after the pods are set on the plants. Rotenone has in the past been available in large quantities but now its production has become restricted and it is more costly than formerly. Rotenone is obtained from certain tropical plants and ground derris and cubé roots are two common materials containing rotenone. The ground root is commonly used in water suspensions as a spray and with diluents as dust. Recommendations follow.

DUST

1. Rotenone dust prepared by the manufacturer and used according to directions on the package.

- *2. Homemade rotenone dust
 Ground derris or cubé root
 (4 per cent rotenone)..... 12½ pounds
 Talc, clay, pyrophyllite or sulfur..... 87½ pounds
- *Or for small amounts
 Ground derris or cubé root
 (4 per cent rotenone).....3 level tablespoonfuls
 Talc, clay, pyrophyllite or sulfur....1 pound
- *1. Ground derris or cubé root
 (4 per cent rotenone)..... 3 pounds
 Water 100 gallons
- *Or for small amounts
- *2. Ground derris or cubé root
 (4 per cent rotenone).....3 level tablespoonfuls
 Water 1 gallon
3. Rotenone spray materials prepared by the manufacturer and used according to the directions on the package.

THE AMOUNT OF INSECTICIDES REQUIRED

About 100 gallons of spray material is necessary to treat one acre of beans. One gallon of spray will effectively cover a row of beans about 125 feet long. These amounts will vary considerably with the age and size of the bean plants. Careful adjustment of spray machinery will often save a considerable amount of insecticide.

About 35 pounds of insecticide in dust form will treat an acre if the dusting machinery is adequate to the job and properly adjusted. A pound of dust will treat effectively a 500 foot row of beans. Dusts are somewhat more expensive in cost but require less labor in application than do spray materials. In general where hand apparatus only is available it is easier to penetrate

* Ground derris or cubé root containing 4 per cent or more of rotenone may not be available at present. These recommendations are included with the thought of using such supplies as are available now or when the situation regarding the rotenone supply is improved.

dense bean foliage with insecticides in dust form than where water sprays are used with the material. Where farmers are already equipped with potato dusters or sprayers, these machines can be adapted to Mexican bean beetle control by slight changes and small expense.

APPLICATION OF INSECTICIDES FOR MEXICAN BEAN BEETLE CONTROL

The effectiveness of the insecticides recommended for the control of the Mexican bean beetle depends to a large extent upon timing of their application to coincide with the feeding period of the insects, and their application in such a manner that the undersides of the bean foliage is protected at all times during the active feeding period of the beetles and their larvae.

The feeding by the adults on young plants is sometimes severe and the application of insecticides early in the season may save the crop and make late season applications unnecessary. If early infestations are not noticed it is a good plan to apply insecticides at about the time the young larvae are hatching but before serious injury is caused. Later applications are necessary if the infestation is not noticed until after the larvae have become large and injury to the bean plants has become extensive. When the pupal stage of the Mexican bean beetle is reached it is then too late to apply insecticides. It is then better to try to harvest the beans and plow under the crop while the inactive pupae are still attached to the plants.

Insecticides in dust form are most effective if applied when the air is relatively still and when there is some moisture on the leaves. Early morning is a good time for dusting but when there is danger of spreading bean diseases, the dusts can be applied during the evening at about the time dew is beginning to be formed on the bean plants. Dusts used in Mexican bean beetle control are most effective when they are not subject to rainfall for at least a few hours after their application.

Three applications of the insecticides recommended for the control of the Mexican bean beetle are sufficient to control the heaviest of infestations under Maine conditions, providing that the insecticides are applied thoroughly under the proper condi-

tions. Sometimes it may be necessary to treat all the beans in a given field or garden. Sometimes the infestations are in small isolated areas which can be controlled by spot dusting or spraying. In cases of light infestation the Mexican bean beetle can be controlled by less than three insecticidal treatments. The larvae should in any case be destroyed and not allowed to mature and move from injured bean plantings to other beans or to winter hibernating quarters.

Thoroughness in applying insecticides for the control of the Mexican bean beetle depends upon the proper adjustment and use of machinery. Each grower will need to adjust his duster or sprayer according to the size of the bean plants, the density of the bean foliage and so that the underneath sides of the leaves are treated. In general, nozzles of the machines will need to be turned slightly upward (see figures 11, 16, 18, 22 and 24), and in cases where more than one row is to be treated at a time, adjustment to row width may be necessary.

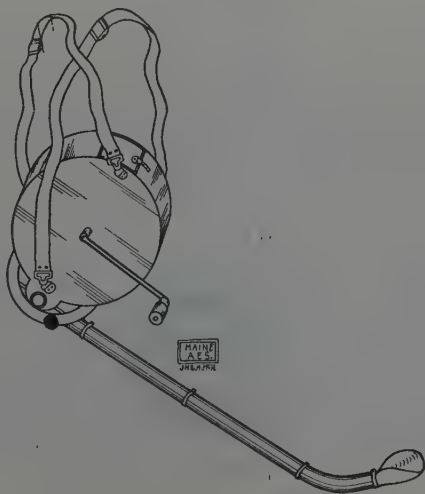


FIG. 11. Rotary type hand duster with nozzle turned up to distribute dust to lower surfaces of bean foliage.

Some of the canning companies of the State have furnished growers with small rotary-type hand-operated dusters for applying insecticides to the beans (Figs. 11 and 12), which have been used for spot dusting of small isolated infestations of the Mexican bean beetle in larger plantings of beans. This type of duster is useful for the gardener or where not more than one fourth of an acre is to be treated. The small plunger type of duster (Fig. 13) is suitable for the treatment of a few feet of row or a few hills of beans. Traction driven row crop or potato dusters (Fig. 14) can be used for treating small fields of beans when the nozzles are properly adjusted. Power-driven dusters (Fig. 15) of the type owned by some of the canning companies and by some potato growers are suitable machines for applying dusts for control of the Mexican bean beetle. These dusters should be equipped with row crop nozzles which can be adjusted, or with special bean beetle nozzles (Fig. 16).



FIG. 12. Another rotary type duster. The fan-shaped delivery nozzle on this duster can be turned upward for proper delivery of the dust to under sides of the bean leaves. (Courtesy Niagara Sprayer and Chemical Co.)

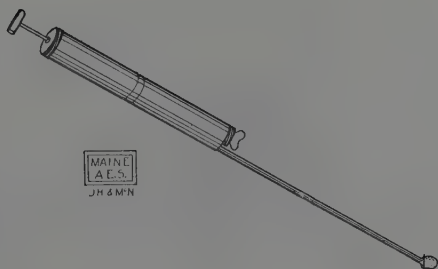


FIG. 13. Small hand duster suitable for use in control of the Mexican bean beetle in small gardens (note that adjustment of delivery bulb is so that dust is distributed upward).



FIG. 14. Horse-drawn traction-driven duster. Many of these dusters are used in Maine for dusting of potatoes. These dusters can be used effectively in control of the Mexican bean beetle by adjusting the nozzles to deliver the dust upward. (*Courtesy Maine Extension Service.*)

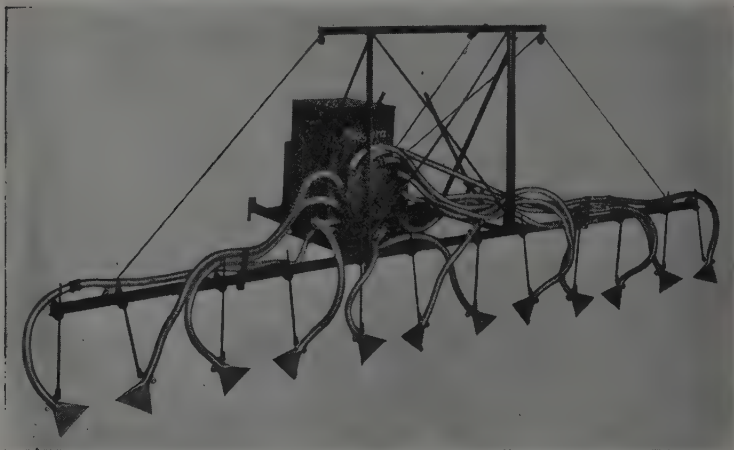


FIG. 15. A large power take-off duster equipped with row crop nozzles which can be adjusted to deliver the dust to under sides of bean leaves for control of the Mexican bean beetle. This type of duster is attached directly to the tractor. (*Courtesy Niagara Sprayer and Chemical Co.*)

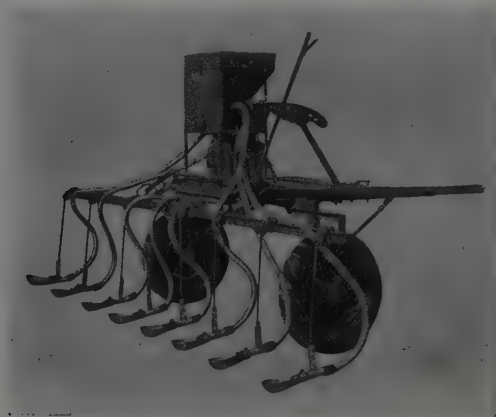


FIG. 16. An engine driven duster equipped with horse hitch. Notice the cup-shaped, turned up bean beetle nozzles on this duster. (*Courtesy Niagara Sprayer and Chemical Co.*)

The ordinary equipment for applying insecticides on many small farms is the traction-driven potato sprayer (Fig. 17) which

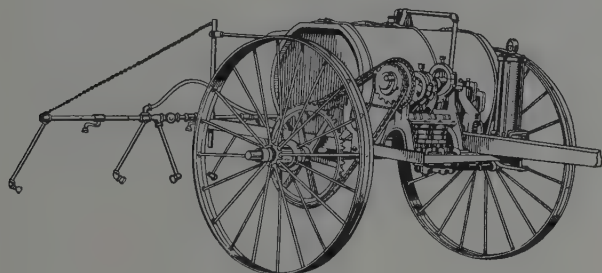


FIG. 17. A horse-drawn, traction-driven sprayer which can be used effectively by turning the nozzles upward. (Courtesy John Bean Mfg. Co.)

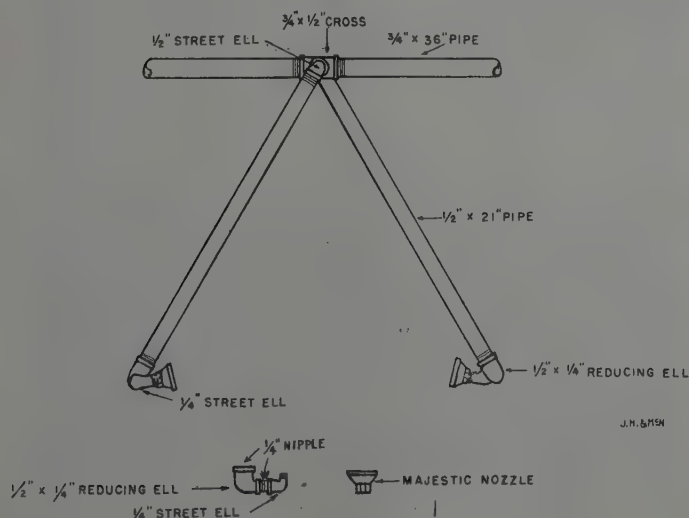


FIG. 18. Detailed drawing of nozzle arrangement for a spray boom found suitable for applying insecticides for Mexican bean beetle control. The nozzles on this boom can be adjusted to the proper angle and height for effective application of the spray. The nozzles can also be used as shown in Figure 19, one of each pair being used for a given row.

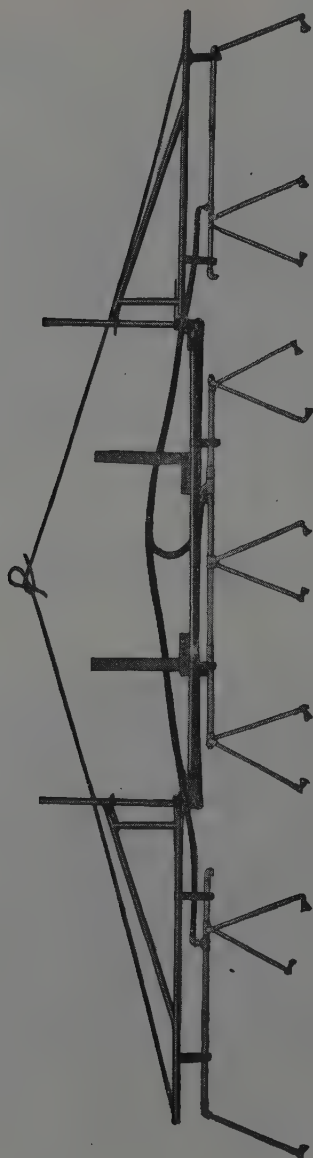


FIG. 19. A six row spray boom using a different nozzle arrangement than that shown in Figure 18. Bean rows would come in the large open spaces between nozzles and the nozzles would need to be turned slightly more upward for spraying of beans than is shown in this figure. (Courtesy John Bean Mfg. Co.)



FIG. 20. A power driven sprayer with boom adjustable for height and angle suitable for spraying beans in Mexican bean beetle control. (*Courtesy John Bean Mfg. Co.*)



FIG. 21. An 8-row sprayer mounted on a tractor with power take-off attachment which could be used in Mexican bean beetle control with minor adjustments. (*Courtesy Maine Extension Service.*)

can be used by making nozzle adjustments similar to Figures 18 and 19. Large power-driven potato sprayers (Figs. 20 and 21) can also be used effectively in Mexican bean beetle control where there are large acreages to be covered and they can be properly adjusted. The 2 to 5 gallon cylinder type sprayer (Fig. 22) and the plunger type hand-operated sprayers (Fig. 23) can be used for spot treatment of small isolated areas where the Mexican bean beetle has become established in larger plantings of beans or

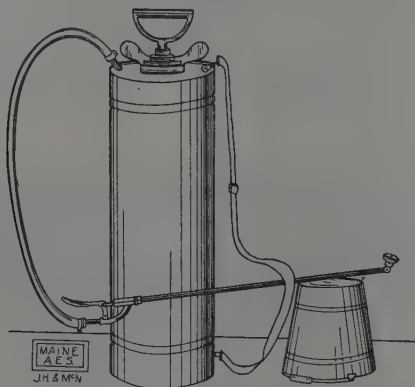


FIG. 22. A cylinder type, compressed air hand-operated sprayer suitable for control of the Mexican bean beetle on small plantings.

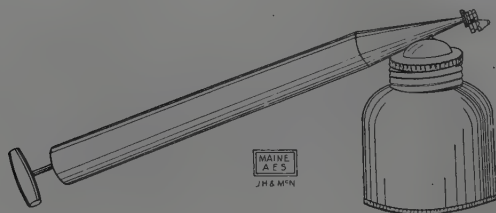


FIG. 23. A small plunger type hand sprayer suitable for the application of insecticides for the control of the Mexican bean beetle only on very small plantings or for spot treatments.

where gardens or small bean patches are to be treated. The knapsack sprayer (Fig. 24) is effective and convenient to use in small gardens and small infested spots in larger plantings. The wheelbarrow sprayer (Fig. 25) is of many types and can be used economically where the area to be treated is not greater than about $\frac{1}{4}$ acre. Some of the wheelbarrow type sprayers have air chambers

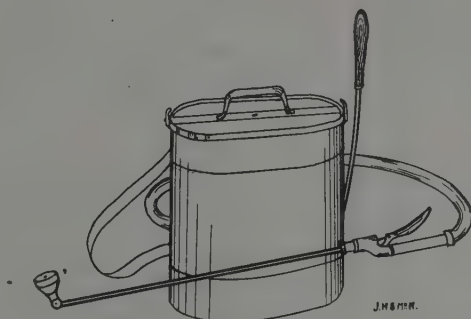


FIG. 24. A knapsack sprayer with nozzle turned upward. This type sprayer is useful for home or small market gardener in Mexican bean beetle control.

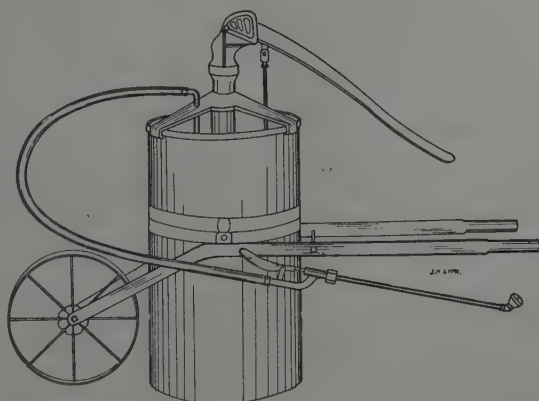


FIG. 25. A wheelbarrow sprayer can be used in the application of insecticides to small bean plantings but is not suitable for large field operations in Mexican bean beetle control.

and some are equipped with small gas engines or electric motors. In general wheelbarrow sprayers are more expensive and more efficient than the smaller hand-operated cylinder knapsack and bucket sprayers. The small hand-operated bucket type sprayer (Fig. 26) is cheap and satisfactory for treating of small bean plantings. There are many other types of dusters and sprayers which cannot be described here for lack of space.

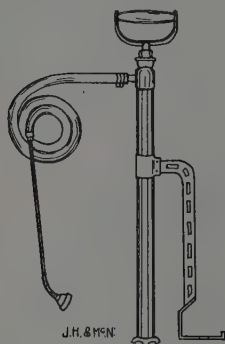


FIG. 26. Bucket or stirrup spray pump. This pump is operated by placing the cylinder in a pail, holding it with the bracket foot piece or stirrup on the outside of the pail and operating the plunger by hand.

TIME OF PLANTING TO ESCAPE EARLY INFESTATION

It is sometimes advisable to plant beans during the period from June 1 to June 12, depending upon the progress of the season. Thus early spring beetle injury is avoided because bean plants are not up until after most of the first flight of beetles has passed. The beetles are then forced to seek other areas in which to lay their eggs for the summer generation. Beans may become infested at any time from June to September but ordinarily the later flights of beetles are not so destructive as the flights occurring during the first few days of June, although the larvae are destructive at all times.

RELATION OF WEEDS IN THE BEAN FIELD TO MEXICAN BEAN BEETLE INJURY

Weeds and grass allowed to grow among the beans favor the Mexican bean beetle by furnishing shelter and breeding places. Weeds among the beans also multiply the difficulty of applying

the insecticides and so weaken the bean plants that they are especially susceptible to the attacks of the beetles and larvae. The judicious use of fertilizer also increases the resistance of the bean plants to attacks by this insect.

PLOWING UNDER BEAN PLANTS AFTER HARVEST

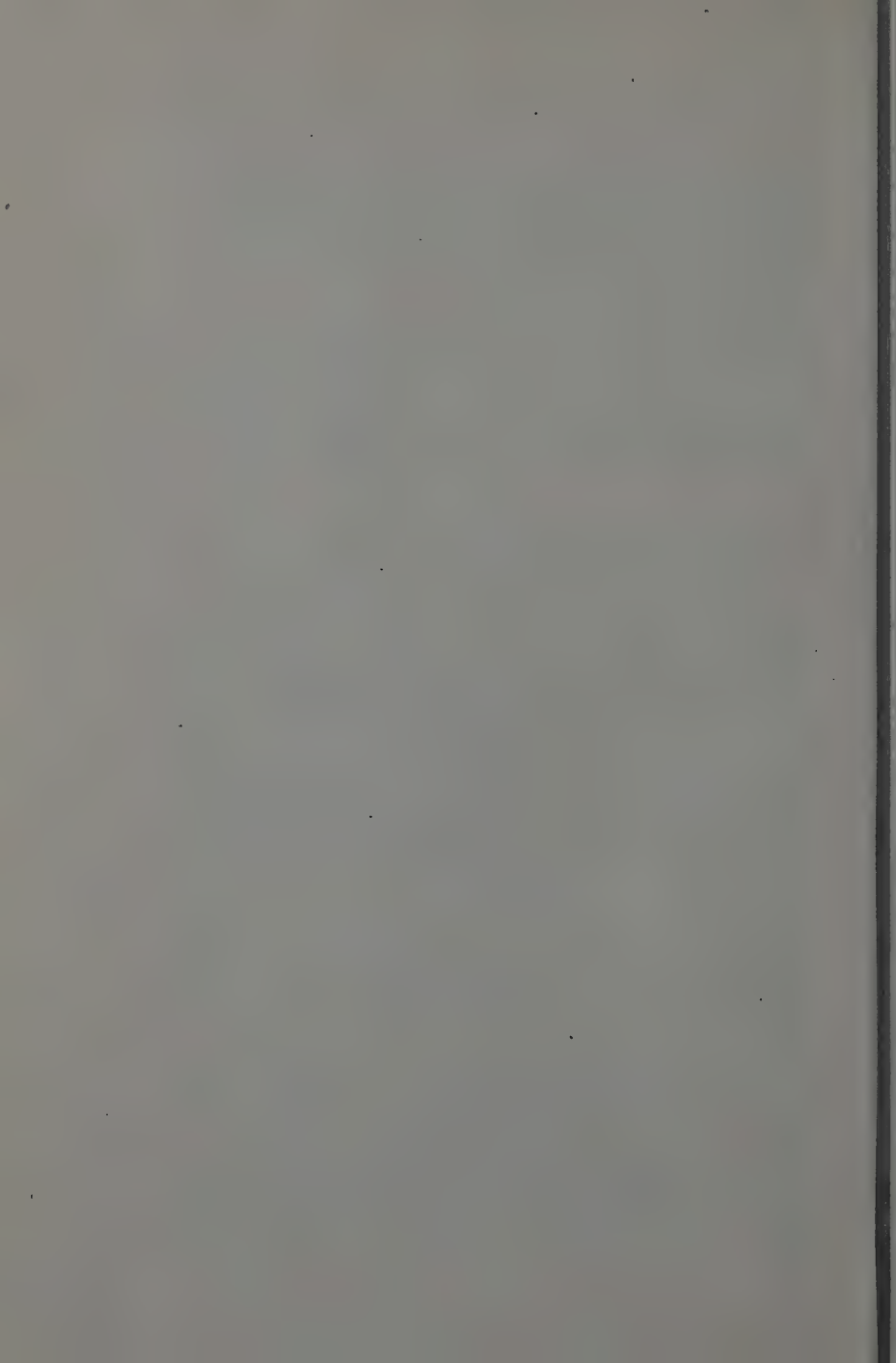
It is a good plan to carefully plow under bean plants soon after the beans are harvested. Plowing during late July and early August will destroy many of the larvae, the inactive pupae and the comparatively helpless beetles when they first emerge.

THE VALUE OF CLEANING UP PLANT REFUSE IN MEXICAN BEAN BEETLE CONTROL

There is danger that beetles may hibernate beneath grass, bean stacks, weeds, and refuse in or near the bean field and it is a good plan to see that these hibernating advantages are removed. Plowing under of such refuse is especially recommended wherever it can possibly be done. Cleaning up or removal of old stone walls and hedge rows is also advisable. The burning over of weedy or grassy areas is doubtless of some value when our fall weather conditions are such that it can be thoroughly done. Burning over of such areas during early spring would be of value in destroying any beetles which might be present at that time.

LITERATURE CITED

- Burgess, I. M. and Bailey, R. M.
1937. Maine Agr. Exp. Sta. Bul. 387, pp. 180-181.
- Burgess, I. M.
1941. Maine Agr. Exp. Sta. Bul. 405, pp. 413-414.
- Douglass, J. R.
1933. Habit, Life History and Control of the Mexican Bean Beetle in Mexico. U.S.D.A. Tech. Bul. 376.
- Howard, N. F., Brannon, L. W. and Mason, H. C.
1936. The Mexican Bean Beetle in the East and Its Control. U.S.D.A. Farmers' Bulletin No. 1624.
- Turner, N. and Friend, R. B.
1935. Further Experiments on Mexican Bean Beetle Control. Conn. Agr. Exp. Sta. Bul. 371, pp. 431-434.



**COSTS AND PRACTICES IN PRODUCING
POTATOES IN SOUTHERN AROOSTOOK
COUNTY, MAINE, 1941**

WILLIAM E. SCHRUMPF¹

Southern Aroostook County is a potato producing area second only in importance in Maine to the Central Aroostook area. The Southern Aroostook area includes all Aroostook County towns south of Mars Hill. This area in 1939 contained 1,344 farms on which were produced 25,982 acres of potatoes. The farms comprised 27 per cent of the potato farms and 22 per cent of the potato acreage of Aroostook County.²

The soil of Southern Aroostook County is similar to that of the Central Aroostook area, that is, it is predominantly Caribou loam. The topography, however, is more rolling and the fields are smaller than in Central Aroostook. Rainfall normally is abundant for good yields of potatoes.

Method and purpose

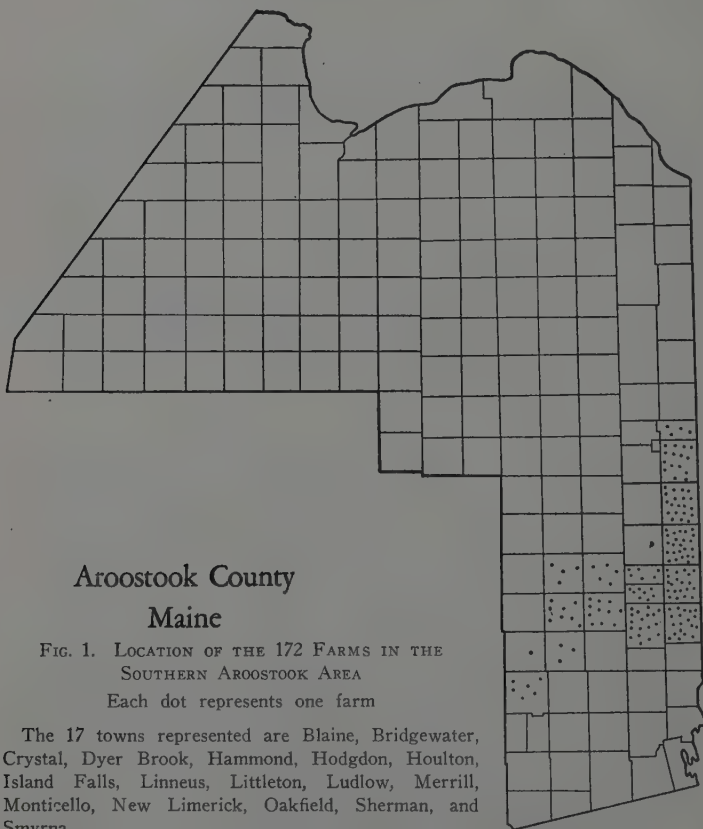
Information concerning the farmer's costs and practices in producing potatoes was obtained on 172 farms in 17 Southern Aroostook towns (figure 1). The information covered the farmer's operations in growing, harvesting, storing, and selling the 1941 crop of potatoes. The information was obtained directly from farmers by the survey method.

The purpose of this study is to present information useful to farmers and to agencies dealing with farmers concerning (1) the crops, livestock, and tractive power on the farms, (2) the application and cost of labor, tractive power, and equipment for the various operations in potato production, the amount and cost

¹ Appreciation is extended to the farmers for supplying information, to Dr. Charles H. Merchant for supervision and criticism, to Malcolm Peckham and Edward Piper for interviewing farmers, and to Belle Dall, Marion Dolan, and Virginia King for assistance in tabulation.

² Computed from information compiled by Merchant, C. H., Maine Agriculture in 1940, A Statistical Presentation. Maine Agricultural Experiment Station Miscellaneous Publication 578, pp. 158 and 159, 1943.

of materials, and the indirect costs, and (3) the factors such as size of business, yield rates, use of labor, and use of capital that affect the costs.



THE FARMS

Under this title are included the farm acreage, the crop acreage, the productive livestock, and the tractive power.

The farm acreage

The average size of the farms was 171 acres. Of this acreage, nearly one-half (49 per cent) was cropland. The remaining 51 per cent was made up of woodland not pastured (34 per cent), open pasture (10 per cent), woodland pastured (3.5 per cent), and farmsteads, roads, and waste land (3.5 per cent).

All the farms, of course, had cropland and farmsteads. There was open pasture on 88 per cent of the farms, woodland not pastured on 86 per cent, and woodland pastured on 23 per cent. For the farms which had the various kinds of land the average acreages per farm were: cropland 84 acres, woodland not pastured 68 acres, woodland pastured 26 acres, and open pasture 19 acres (table 1).

TABLE 1

Farm Acreage in Southern Aroostook County, Maine, 1941

Item	Acres per farm	Per cent of total farm acreage	For farms having the item	
			Acres per farm	Per cent of farms
Cropland	84	49.0	84	100.0
Open pasture	17	10.0	19	88.4
Woodland pastured	6	3.5	26	22.7
Woodland not pastured	58	34.0	68	86.0
Farmsteads, etc.	6	3.5	6	100.0
Total	171	100.0		

Variation in farm acreage. The most common size of farm was between 100 and 150 acres (average 122 acres). Nearly 28 per cent of the farms were in this range. Twenty-three per cent were in the range 150 to 199 acres and 20 per cent had less than 100 acres of land per farm. Having 250 or more acres per farm were 13 per cent of the farms.

The 20 per cent of the farms having less than 100 acres of land per farm comprised only 9 per cent of the total farm acreage

while the 13 per cent having 250 or more acres of land per farm comprised 28 per cent (table 2).

Relation of farm acreage to acreage in cropland, pasture land, and woodland. The proportion of the farm acreage in crop-

TABLE 2

Variation in Farm Acreage in Southern Aroostook County, Maine, 1941

Farm acres	Average acres of farmland	Number of		Per cent of	
		Farms	Acres	Farms	Acres
Less than 100	74	35	2,602	20.3	8.9
100 - 149	122	48	5,833	27.9	20.0
150 - 199	169	39	6,608	22.7	22.5
200 - 249	221	27	5,980	15.7	20.4
250 or more	301	23	8,310	13.4	28.2
Total or average	171	172	29,363	100.0	100.0

land and pasture land decreased as the size of farm increased, but the proportion in woodland increased. The farms of less than 100 acres had, on the average, 61 per cent of the land in crops and 13 per cent in open pasture. In comparison, the farms of 250 or more acres had 40 per cent of the land in crops and 9 per cent in open pasture. Woodland not pastured, on the other hand, increased from 17 per cent for farms of less than 100 acres per farm to 48 per cent for farms of 250 or more acres (table 3).

TABLE 3

Relation of Farm Acreage to Acreage in Cropland, Pasture land, and Woodland in Southern Aroostook County, Maine, 1941

Farm acres per farm	Number of farms	Per cent of farm acreage in				
		Cropland	Open pasture	Woodland pastured	Woodland not pastured	Farmsteads etc.
Less than 100	35	61.0	13.1	4.1	17.4	4.4
100 - 149	48	55.9	11.3	4.9	23.3	4.6
150 - 199	39	51.4	9.8	2.7	32.6	3.5
200 - 249	27	48.4	9.2	4.9	34.4	3.1
250 or more	23	39.5	8.6	1.7	48.2	2.0
All farms	172	49.0	10.0	3.5	34.0	3.5

Crop acreage

Of the 84 acres of cropland per farm, about 30 per cent was in potatoes, 21 per cent in grain (practically all oats), 42 per cent in hay, and most of the remaining 7 per cent in green manure crops, factory peas, and rotated pasture.

All the farms of course had potatoes. Ninety-eight per cent had oats, 83 per cent had new-seeded hay, 25 per cent had factory peas, and 15 per cent had green manure crops. On the farms producing the various crops the average acreages were: potatoes 25 acres, oats 17 acres, new-seeded hay 16 acres, mixed hay 24 acres, green manure crops 13 acres, and factory peas 7 acres (table 4).

On the land planted to potatoes, less than one-third (30.7 per cent) produced potatoes the preceding year. Fifty per cent was in sod the preceding year and 9 per cent in green manure crops. The remainder was either in oats or in peas for manufacture.

TABLE 4

Crop Acreage in Southern Aroostook County, Maine, 1941

Kind of crop	Acres per farm	Per cent of total crop acreage	For farms having the item	
			Acres per farm	Per cent of farms
Potatoes	24.9	29.7	24.9	100.0
Oats	16.6	19.8	17.0	97.8
Other grain*	1.2	1.4	4.9	23.8
New-seeded hay	13.4	16.0	16.3	82.6
Mixed hay	21.9	26.1	24.2	90.7
Green manure crops	2.0	2.4	13.2	15.1
Factory peas	1.7	2.0	6.9	25.0
Rotated pasture	1.7	2.0	10.2	16.9
Other†	.5	.6	14.2	3.5
Total	83.9	100.0		

* Includes wheat, barley, buckwheat, and rye.

† Includes summer fallow and beans.

Variation in crop acreage. The most common crop acreage was between 50 and 75 acres. Thirty-two per cent of the farms had crop acreages in this range, the average being 61 acres. Nineteen per cent of the farms had less than 50 acres of cropland per farm and 14 per cent had 125 or more acres. Of the total crop acreage of all the farms, 8 per cent was accounted for by the farms of less than 50 acres of cropland and 28 per cent by the farms having 125 or more acres of cropland (table 5).

TABLE 5

Variation in Crop Acreage in Southern Aroostook County, Maine, 1941

Acres of crops	Average acres of crops	Number of		Per cent of	
		Farms	Acres	Farms	Acres
Less than 50	38	32	1,207	18.6	8.4
50 - 74	61	55	3,359	32.0	23.3
75 - 99	84	35	2,955	20.3	20.5
100 - 124	110	26	2,866	15.1	19.9
125 or more	169	24	4,049	14.0	27.9
All farms		172	14,436	100.0	100.0

Relation of crop acreage to acreage of potatoes and number of animal units. As would be expected, the acres of potatoes increased as the acres of crops increased. However, the percentage of the cropland that was in potatoes did not increase but remained fairly close to the all-farm average of 30 per cent.

The number of animal units increased, from an average of 6 per farm for the farms having less than 50 crop acres to an average of 16 for the farms having 125 or more crop acres. However, on the basis of crop acres per animal unit the smaller farms were more intensive producers of livestock than the larger farms. Crop acres averaged 6 per animal unit for the farms of less than 50 crop acres per farm and 11 per animal unit for the farms of 125 or more crop acres (table 6).

TABLE 6

Relation of Crop Acreage to Acreage of Potatoes and to Number of Animal Units in Southern Aroostook County, Maine, 1941

Acres of crops	Number of farms	Average per farm of			Per cent of crop acres in potatoes	Crop acres per animal unit
		Crop acres	Potato acres	Animal units		
Less than 50	32	38	12.9	6.0	33.9	6.2
50 - 74	55	61	16.5	7.1	27.0	8.6
75 - 99	35	84	25.2	8.1	30.0	10.4
100 - 124	23	110	32.7	10.5	29.7	10.5
125 or more	24	169	50.8	15.7	30.0	10.8
All farms	172	84	24.9	8.8	29.7	9.5

Varieties of potatoes. Although nine different varieties of potatoes were produced on these Southern Aroostook County farms the two varieties, Katahdin and Green Mountain, made up nearly four-fifths (79 per cent) of the total potato acreage. Other varieties in descending order of acreage were: Houma, Earleine, Irish Cobbler, Chippewa, Sebago, Russet Rural, and Warba.

Katahdin potatoes were produced on 86 per cent of the farms, Green Mountain on 67 per cent, Earleine, Houma, and Irish Cobbler each on 22 per cent, Chippewa and Sebago each on 13 per cent, and Russet Rural and Warba each on less than 2 per cent. The average acreages per farm for the farms growing the variety were: Katahdin 14.7 acres, Green Mountain 10.4 acres, Chippewa 6.8 acres, Houma 6.2 acres, Sebago 5.9 acres, and Earleine 5.6 acres. Of the other three varieties there were less than 5 acres each per farm (table 7).

TABLE 7

Varieties of Potatoes Produced in Southern Aroostook County, Maine, 1941

Variety	Acres of potatoes	Per cent of total potato acreage	For farms having the item	
			Acres of potatoes per farm	Per cent of farms
Katahdin	2,173	50.8	14.7	86.0
Green Mountain	1,204	28.1	10.4	67.4
Houma	228	5.3	6.2	21.5
Earleine	206	4.8	5.6	21.5
Irish Cobbler	164	3.8	4.4	21.5
Chippewa	157	3.7	6.8	13.4
Sebago	135	3.2	5.9	13.4
Russet Rural	12	.3	4.2	1.7
Warba	1	—*	1.0	.6
All varieties	4,280	100.0		

* Less than .05 per cent.

Livestock

The livestock was made up mostly of dairy animals. Other classes of livestock kept were beef animals, poultry, swine, and sheep. A common measure of different kinds of livestock is the animal unit. Animal unit equivalents are 1 cow, 2 heifers, 5 swine, 7 sheep, and 100 hens.

In terms of animal units, 74 per cent of the livestock was dairy animals made up of 55 per cent cows and 19 per cent other dairy animals. Twelve per cent of the livestock was beef animals, 6 per cent was swine, 5 per cent was poultry, and 2 per cent was sheep.

All but 4 per cent of the farms had dairy cows and three-fourths of the farms had dairy animals other than cows. Poultry was an enterprise on 90 per cent of the farms, swine on 82 per cent, beef animals on 33 per cent, and sheep on 10 per cent. For the farms having the different kinds of livestock, the numbers kept per farm were: dairy cows 5, other dairy animals 4, beef animals 4, swine 3, poultry 49, and sheep 15 (table 8).

TABLE 8

Livestock in Southern Arrostook County, Maine, 1941

Item	Number of animals	Number of animal units	Per cent of animal units	For farms having the item	
				Animals per farm	Per cent of farms
Dairy cows	794	794	54.9	5	96
Other dairy animals	474	280	19.4	4	76
Beef animals	232	174	12.0	4	33
Swine	444	88	6.1	3	82
Poultry*	7,516	75	5.2	49	90
Sheep	252	35	2.4	15	10
All livestock		1,446	100.0		

* One farm omitted because of abnormal situation.

Variation in number of animal units. More than one-half (52.7 per cent) of the farms had less than 7 animal units per farm while about 15 per cent had 14 or more animal units per farm. About one-third of the farms had animal units ranging between 3.5 and 7.0 per farm, the average of the group being 5.2 per farm. The average of all the farms was 8.5 animal units. Of the total animal units, nearly 38 per cent were on the farms having 14 or more units per farm while 25.5 per cent were on the farms having less than 7 units per farm. As the number of animals per farm increased the proportion that was dairy cows decreased. On the farms having less than 3.5 animal units per farm, 67 per cent were dairy cows while on the farms having 14 or more units per farm 55 per cent were dairy cows (table 9).

TABLE 9

Variation in Number of Animal Units in Southern Aroostook County, Maine, 1941

Animal units	Average animal units	Per cent of animal units in dairy cows	Number of		Per cent of	
			Farms*	Animal units	Farms	Animal units
Less than 3.5	2.2	67.0	33	71.6	19.3	5.0
3.5 - 6.9	5.2	59.2	57	297.1	33.4	29.5
7.0 - 10.4	8.6	55.7	38	326.6	22.2	22.6
10.5 - 13.9	11.9	46.8	17	203.0	9.9	14.0
14.0 or more	21.1	54.8	26	547.6	15.2	37.9
Total or average	8.5	54.9	171	1,445.9	100.0	100.0

* One farm omitted because of abnormal situation.

Relation of number of animal units to acres of pasture. The pasture includes permanent open pasture, rotated pasture, and the open pasture equivalent of woodland pastured but it does not include second-crop grazing of hay fields. The livestock pastured included dairy animals, beef animals, and sheep. These animals made up 86 per cent of the total animal units.

The pasture acreage per animal unit of grazing animals decreased as the number of animal units per farm increased. On the farms having less than 3.5 animal units per farm, acres of pasture averaged 7.3 per grazing animal unit while on the farms having 14 or more units per farm, acres of pasture averaged 2.0 per animal unit (table 10).

TABLE 10

Relation of Number of Animal Units to Acres of Pasture in Southern Aroostook County, Maine, 1941

Animal units	Number* of farms	Animal units per farm			Acres of pasture per grazing animal unit
		Total	Grazing animals	Dairy cows	
Less than 3.5	33	2.2	1.7	1.5	7.3
3.5 - 6.9	57	5.2	4.6	3.1	3.4
7.0 - 10.4	38	8.6	7.8	4.8	2.5
10.5 - 13.9	17	11.9	10.4	5.6	2.8
14.0 or more	26	21.1	19.6	11.5	2.0
Total or average	171	8.5	7.6	4.7	2.7

* One farm omitted because of abnormal situation.

For the more than 80 per cent of the farms which have 3.5 or more animal units per farm, the acres of pasture averaged less than 3.5 per animal unit while the average of all the farms was 2.7 acres of pasture per animal unit. In the dairy areas of the State, the average is approximately 4.0 acres of pasture per animal unit.³

Tractive power

Under tractive power are included horses, trucks, and tractors. On the 172 farms there were 374 horses, 123 trucks, and 107 tractors. Of the 107 tractors, 93 were general-purpose, that is they were adapted to cultivating, hilling, spraying, dusting, and digging potatoes as well as to plowing and harrowing. The 14 standard tractors, on the other hand, were used largely for harrowing and to some extent for plowing.

Horses made up all or part of the tractive power on 92 per cent of the farms. In other words, 8 per cent of the farms were operated entirely without horses. Two-thirds (67 per cent) of the farms had trucks, more than one-half (52 per cent) had general-purpose tractors while 8 per cent had standard tractors (table 11).

TABLE 11

*Tractive Power in Southern Aroostook County,
Maine, 1941*

Tractive power	Total number	Per cent of farms
Horses	374	91.9
Trucks	123	67.4
General-purpose tractors	93	52.3
Standard tractors	14	8.1

Tractive-power units: Two horses, 1 general-purpose tractor, and 1 truck composed the most common unit of tractive power. Nearly 27 per cent of the farms had this unit. The average crop

³ Dow, George F., Costs and Returns in Producing Milk, Raising Heifers, and Keeping Bulls in Maine. Maine Agricultural Experiment Station Bulletin 361, p. 55. 1932.

acreage on these farms was 101 acres and the average acreage of potatoes was 32 acres. The next most common tractive-power unit (in use on about 22 per cent of the farms) was 2 horses. The average acres of crops was 53 on these farms and the acres of potatoes averaged 13 per farm. The next important unit in descending order of per cent of farms was 2 horses and 1 truck. On the 11 per cent of the farms having this unit the acres of crops averaged 65 and of potatoes about 15 per farm. Compared with the farms having a tractive-power unit of 2 horses, those with 2 horses and 1 truck averaged 12 more crop acres per farm and those with 2 horses, 1 truck, and 1 general-purpose tractor averaged 48 more crop acres per farm.

Nearly 6 per cent of the farms were operated with 1 general-purpose tractor and 1 truck for tractive power. These farms had 85 crop acres, on the average, of which about 32 acres was potatoes. They also had the largest proportion of cropland in potatoes, nearly two-fifths, compared with less than one-third for the farms having tractive-power units composed of 2 horses, 1 tractor, and 1 truck and with less than one-fourth for the farms having either 2 horses and 1 truck or 2 horses. Other tractive-power units found on a number of farms were: 2 horses, 1 standard tractor, and 1 truck; 4 horses, 1 standard tractor, and 1 truck; 2 horses and 1 general-purpose tractor; 2 horses and 1 standard tractor; and 4 horses and 1 truck.

Tractive-power work was hired on 52 per cent of the farms. All the farms having tractive-power units of 2 horses hired some tractive-power work done. The cost of this work ranged from \$7 to \$296 per farm. The average cost was \$9.19 per farm of which 21 per cent was for tractor hire and 79 per cent for truck hire. In contrast of the farms having 2 horses, 1 tractor, and 1 truck as the tractive-power unit, only 19 per cent hired this kind of work. The cost of tractive-power work hired on these farms ranged from \$8 to \$323 per farm and was all for truck hire. The average cost of all the farms in this group was 45 cents per farm.

On the average, the addition of a general-purpose tractor was accompanied by an increase of about 18 acres of potatoes, of a truck by 13 acres, of two horses by 9 acres, and of a standard tractor by 8 acres.

There was, however, much variation in the potato acreage of different farms operated with the same kind of tractive power.

For farms having 2 horses in one instance there were 7 acres of potatoes and 16 acres of other crops, in another instance 24 acres of potatoes and 51 acres of other crops. The other crops in each case were mostly oats and hay. On each of these farms some tractive-power work on potatoes was hired. In the first instance truck work was hired, mostly for hauling potatoes. In the second instance, truck work for hauling potatoes and tractor work for harrowing was hired.

A more striking example is between different farms having 2 horses, 1 tractor, and 1 truck for tractive power. On one farm having this unit there were 12 acres of potatoes and 38 acres of other crops, mostly oats and hay. On another farm there were 52 acres of potatoes and 104 acres of other crops, including, besides

TABLE 12

Tractive-Power Units in Southern Aroostook County, Maine, 1941

Tractive-power unit	Per cent of farms	Acres of crops per farm	Acres of potatoes per farm	Per cent of cropland in potatoes	Average cost per farm of tractive-power work hired (dollars)		
					Horses	Tractor	Truck
2 horses 1 general-purpose tractor 1 truck	26.7	101	32.3	32.0	—	—	.45
2 horses	22.1	53	13.1	24.7	—	1.97	7.22
2 horses 1 truck	11.0	65	14.8	22.8	—	1.85	.73
2 horses 1 standard tractor 1 truck	7.6	82	21.8	26.6	—	.07	.35
1 general-purpose tractor 1 truck	5.8	85	32.1	37.8	.72	.07	.06
4 horses 1 standard tractor 1 truck	4.1	88	28.7	32.6	—	—	.35
2 horses 1 general-purpose tractor	3.5	100	24.0	24.0	—	—	8.94
2 horses 1 standard tractor	2.9	65	13.4	20.6	—	.90	7.06
4 horses 1 truck	2.9	78	23.0	29.5	—	—	.10
Other units	13.4	118	38.5	32.3	.44	.13	3.17
All farms	100.0	84	24.9	29.3	.14	.31	2.16

oats and hay, 9 acres of factory peas. On neither of these farms was any tractive-power work hired.

In general, with each type of tractive power the farms with the largest acreages of potatoes had the largest amounts of hired tractive-power work on potatoes. Evidently in many instances farmers found it more economical to hire some tractive-power work done than to own the extra tractive power necessary to do the work.

THE FARMER'S COST OF PRODUCING AND MARKETING POTATOES

The farmer's cost of producing and marketing comprises all the cost of growing, harvesting, storing, and selling the potato crop. The cost includes labor, power, equipment, seed potatoes, fertilizer, spray and dust materials, and all other direct and indirect cost items. The farmer's production and marketing cost in producing potatoes averaged \$153.91 per acre, or \$1.41 per barrel, on these Southern Aroostook County farms in 1941. Of the total cost, nearly two-thirds (63 per cent) was for growing the crop. Eleven per cent of the cost was for harvesting, 23 per cent for storing (including the cost of shrinkage in storage), and 3 per cent was for selling (table 13).

TABLE 13

*Farmer's Cost of Producing and Marketing Potatoes
in Southern Aroostook County, Maine, 1941*

Item	Cost		Per cent of total cost
	Dollars per acre	Cents per barrel	
Growing	96.95	88.7	63.0
Harvesting	17.06	15.6	11.1
Storing	34.95	32.0	22.7
Selling	4.95	4.5	3.2
Total	153.91	140.8	100.0

Cost of labor, tractive power, and equipment

The cost of \$63.01 per acre for labor, tractive power, and equipment was 41 per cent of the farmer's entire cost of produc-

ing and marketing potatoes. Of the total labor, tractive power, and equipment cost, 47 per cent was for labor, 20 per cent for use of horses, 11 per cent for use of trucks, 11 per cent for use of equipment, 8 per cent for use of tractors, and 3 per cent for farm use of automobile (table 14).

TABLE 14

Cost of Labor, Tractive Power, and Equipment in Producing Potatoes in Southern Aroostook County, Maine, 1941

Item	Cost per acre (dollars)					Per cent of total cost
	Growing	Harvesting	Storing	Selling	Total	
Man	14.14	12.21	1.61	1.58	29.54	46.8
Horse	9.76	2.33	.31	.05	12.45	19.8
Tractor	4.66	.51	—*	—*	5.17	8.2
Truck	2.00	—*	2.45	2.49	6.94	11.0
Automobile	1.28	.26	.26	.26	2.06	3.3
Equipment	4.62	1.72	.36	.15	6.85	10.9
Total	36.46	17.03	4.99	4.53	63.01	100.0

* Less than .5 cent.

Time expended. The time expended in the production of an acre of potatoes averaged 82.9 man hours, 47.0 horse hours, 9.2 truck hours, and 6.4 tractor hours. Growing the crop accounted for the major part of the man, horse, and tractor hours but the largest proportion of truck hours was expended in the operations connected with selling. Of the man hours, about 53 per cent were accounted for by the operations in growing the potato crop, compared with 31 per cent in harvesting, 9 per cent in selling,

TABLE 15

Time Expended in Producing Potatoes in Southern Aroostook County, Maine, 1941

Item	Hours per acre				Per cent of total hours			
	Man	Horse	Truck	Tractor	Man	Horse	Truck	Tractor
Growing	43.8	37.1	2.3	5.6	52.8	78.9	25.0	87.5
Harvesting	25.8	8.3	—	.8	31.1	17.7	—	12.5
Storing	6.1	1.3	2.9	—	7.4	2.8	31.5	—
Selling	7.2	.3	4.0	—	8.7	.6	43.5	—
Total	82.9	47.0	9.2	6.4	100.0	100.0	100.0	100.0

and 7 per cent in storing. Of the horse hours, approximately 79 per cent were expended in growing and of tractor hours 88 per cent. Of the truck hours, nearly 44 per cent were expended in selling, compared with 31 per cent for storing, and 25 per cent for growing (table 15).

Operations performed by man labor alone. These operations include mixing fertilizer, treating seed, cutting seed, hand hoeing, roguing, picking up potatoes at harvest, storage care, and grading and bagging potatoes. The cost includes labor and equipment.

Fertilizer was mixed by the farmers for only 43 acres of potatoes which is about 1 per cent of the total potato acreage of the 172 farms. The time expended in mixing fertilizer averaged 4 hours per acre. The cost of labor and equipment was \$1.39 per acre of which all but 3 cents was for labor.

Seed potatoes sufficient to plant 255 acres were treated for the prevention of disease. This acreage is 6 per cent of the total. The time expended treating seed averaged about 1 hour per acre. The average labor and equipment cost per acre was 37 cents of which 27 cents was for labor.

Seed potatoes were cut for planting for 4,255 acres or 99 per cent of the total acreage. On the remaining acreage whole seed was planted. The average time of cutting seed was 6 hours per acre. The cost was \$2.05 of which \$2.01 was for labor.

Hand hoeing, including weed pulling, was an operation on 3,711 acres of potatoes or 87 per cent of the total. The time per acre in hand hoeing averaged about 5 hours. The average cost was \$1.70 per acre of which \$1.67 was for labor.

Roguing, the pulling up of diseased potato plants, was an operation on 198 acres of potatoes or less than 5 per cent of the total acreage. Not all the rogued potatoes were certified. Some farmers had seed plots for their own planting. These farm seed plots were not rogued as often as the commercial certified seed acreage. The average time expended in roguing was 8 hours per acre. The average cost was \$2.81 of which \$2.76 was for labor.

Potatoes were, of course, picked up on the entire acreage. The average time in picking up an acre of potatoes was nearly 21 hours. The cost of labor and equipment was \$10.92 per acre of which \$10.52 was for labor. The average rate of picking up was 53 barrels per day and the average rate of pay per barrel was 9.6 cents.

Storage care consisted largely of keeping fires in stoves in the potato storage houses to prevent freezing injury and also of odd jobs about the storage houses. Farmers supplied their own storage care for the potatoes grown on 1,350 acres or 31.5 per cent of the total acreage. The time expended in the care of potatoes in storage averaged 5 hours per acre. The cost was \$2.67 per acre including \$1.73 for labor, 73 cents for the fuel (mostly wood) burned in the stoves, and 21 cents for equipment.

Grading and bagging potatoes by the farmer was an operation performed largely in connection with potatoes put up at the farm and hauled away by truck. A few farmers who shipped their own potatoes did their own grading and bagging at the track-side storage houses. The usual procedure however is for the purchaser of the potatoes to do this work. The farmers did their own grading and bagging for the potatoes produced on 452 acres or about 11 per cent of the total acreage. About 22 hours of man labor were expended per acre in grading and bagging potatoes. The cost was \$8.80 per acre of which \$7.81 was for labor, 17 cents was for electricity used in operating the grader, and 82 cents for equipment.

TABLE 16

Operations Performed by Man Labor Alone in Producing Potatoes in Southern Aroostook County, Maine, 1941

Operation	Acres of potatoes	Hours per acre	Cost per acre (dollars)		
			Labor	Equipment	Total
Mixing fertilizer	43	4.0	1.36	.03	1.39
Treating seed	255	.9	.27	.10	.37
Cutting seed	4,255	6.2	2.01	.04	2.05
Hand hoeing	3,711	5.1	1.67	.08	1.70
Roguing	198	8.4	2.76	.05	2.81
Picking up	4,280	20.6	10.52	.40	10.92
Storage care	1,350	5.4	1.73	.94*	2.67
Grading and bagging	452	22.4	7.81	.99†	8.80

* Includes 73 cents per acre for fuel.

† Includes 17 cents per acre for electricity.

Operations performed with horses or tractors. These operations include hauling manure, plowing, harrowing, planting, cultivating and hilling, spraying, dusting, and digging. The cost includes man labor, use of tractive power, and use of equipment.

Of the total 4,280 acres of potatoes, 865 were manured. On 738 acres manure was hauled with horses, on 62 acres with a tractor, and on 65 acres with a truck. The comparison of horses and trucks is shown in the next section. Manure was not applied at uniform rates to the potato land manured but was spread on those portions of the fields, such as knolls, that appeared to have the greatest need. Most of the manure was applied with manure spreaders but a considerable portion, especially of that hauled with horses and trucks, was spread by hand. In many instances two men were used. Eight hours, on the average, were required per acre in spreading manure with horses, compared with 4.1 hours with a tractor. The average cost of labor, tractive power, and equipment with 2 horses was \$9.14 and with a tractor \$7.74.

Horses were used in plowing 2,043 acres of potato land and tractors in plowing 2,210 acres. The remaining 27 acres were not plowed but were simply harrowed and then planted. In plowing with horses the sulky plow was used almost entirely. This type of machine plowed one furrow at a time. In most of the plowing with tractors two furrows were turned at a time. One man and a pair of horses, on the average, plowed one acre in 8.2 hours. In comparison, one man and a tractor plowed one acre in 2.3 hours. The cost of labor, power, and equipment in plowing with horses averaged \$7.71 per acre and with a tractor \$3.44 per acre.

In harrowing, tractors were used on 3,707 acres and horses on 573 acres. Nearly all the harrowing was done with the spring-tooth type of harrow. Disk harrows were not used very much. The harrows hauled by horses were, in general, smaller than those hauled by tractors although in some instances the harrows hauled by tractors were of the smaller type. Land was harrowed with horses only slightly less than with tractors, an average of 2.8 times with horses compared with an average of 2.9 times with tractors. One man and a pair of horses harrowed one acre once in 1.2 hours compared with 0.6 hour for one man and a tractor. The cost of harrowing one acre once with two horses was \$1.17 and with a tractor 88.cents.

Nearly twice as many acres of potatoes were planted with horses as with tractors, 2,784 acres with horses and 1,496 acres with tractors. Most of the planters used with horses planted one row at a time while many of the planters used with tractors planted

two rows at a time. A common practice was to have an extra man in the field to help fill the fertilizer and seed hoppers on the planter. In planting with a tractor there was usually a man on the tractor and a second man on the planter. To plant an acre of potatoes with horses required about twice the time (3.1 hours) as with a tractor (1.5 hours). The planting cost of labor, power, and equipment with horses was \$3.97 per acre and with a tractor \$2.75 per acre.

Cultivating and hilling was practically always accomplished at one operation with a tractor. Both the cultivating and hilling devices were attached to the tractor, the hilling device behind the cultivator. With horses, on the other hand, the two operations were nearly always separate. One operation was required for cultivating and another for hilling. With horses, potatoes were cultivated and hilled an average of 3.6 times and with a tractor 3.7 times. The average time required with horses to cultivate and hill one acre of potatoes once was 3.7 hours. In comparison, this work was accomplished with a tractor in 0.9 hour. The cost of labor, power, and equipment of cultivating and hilling one acre of potatoes once with horses was \$3.45 and with a tractor \$1.41.

In spraying, horses were used on 2,084 acres and tractors on 491 acres. The horse sprayers were nearly all traction machines, that is, the power to operate the sprayer pump was obtained from the traction of the sprayer wheels on the ground. A few of the horse sprayers were equipped with a gasoline engine to operate the pump. Some of the tractor sprayers had the sprayer tanks mounted on the tractor. Some were large sprayers hauled behind the tractors and some were built-over horse sprayers. In general, the tractor machines sprayed more rows of potatoes at a time than the horse-drawn machines. With horses, potatoes were sprayed an average of 4.6 times and with tractors an average of 5.0 times. Spraying with two horses required an average of 1.1 hours per acre for one spray and with a tractor 0.7 hour. The time included mixing the spray material. Spraying one acre once with horses cost, on the average, \$1.31 per acre and with a tractor \$1.02 per acre. This cost included labor, power, equipment, and the cost of fuel for the gasoline engines used.

In dusting, horses were used on 1,457 acres and tractors on 248 acres. Horse dusters nearly all obtained power from the traction of the wheels on the ground. Tractor dusting equipment was,

in many cases, mounted on the tractor. Dust was applied an average of 4.3 times with horses and an average of 5.4 times with tractors. The average time per acre in dusting once was 0.5 hour with horses and 0.4 hour with tractors. The average cost per acre for labor, power, and equipment in dusting once with horses was 65 cents and with tractors 53 cents.

Horses were used in digging 3,370 acres of potatoes and tractors 910 acres. The horse diggers were of two kinds, traction and engine. The traction diggers received the power to operate the elevators from the traction of the wheels on the ground and the engine diggers received power from a gasoline engine mounted on the machine. These horse diggers were all single-unit machines, that

TABLE 17

Operations Performed with Horses or Tractors in Producing Potatoes in Southern Aroostook County, Maine, 1941

Operation and tractive power	Acres of potatoes	Hours per acre		Cost per acre (dollars)				Times over	Per acre once over	
		Man	Tractive power	Man	Tractive power	Equipment	Total		Hours	Dollars
Hauling manure:										
2 horses	738	12.5	16.0	4.06	4.05	1.03	9.14	1.0	8.0	9.14
1 tractor	62	4.7	4.1	1.71	4.47	1.53	7.74	1.0	4.1	7.74
Plowing:										
2 horses	2,043	8.2	16.4	2.71	4.28	.72	7.71	1.0	8.2	7.71
1 tractor	2,210	2.3	2.3	.77	1.99	.68	3.44	1.0	2.3	3.44
Harrowing:										
2 horses	573	3.5	6.9	1.10	1.67	.50	3.27	2.8	1.2	1.17
1 tractor	3,707	1.6	1.6	.54	1.54	.46	2.54	2.9	.6	.88
Planting:										
2 horses	2,784	4.2	6.1	1.39	1.69	.89	3.97	1.0	3.1	3.97
1 tractor	1,496	2.9	1.5	.94	.94	.87	2.75	1.0	1.5	2.75
Cultivating and hilling										
2 horses	1,885	14.0	20.8	4.51	6.84	1.07	12.42	3.6	3.7	3.45
1 tractor	2,395	5.5	3.4	1.86	2.62	.75	5.23	3.7	.9	1.41
Spraying:										
2 horses	2,084	5.8	9.8	1.83	2.61	1.59	6.03	4.6	1.1	1.31
1 tractor	491	4.5	3.3	1.58	2.37	1.16	5.11	5.0	.7	1.02
Dusting:										
2 horses	1,457	2.5	4.4	.84	1.26	.71	2.81	4.3	.5	.65
1 tractor	248	2.2	2.1	.71	1.45	.70	2.86	5.4	.4	.53
Digging:										
2 horses	3,370	5.4	10.6	1.76	2.95	1.82	6.53	1.0	5.3	6.53
1 tractor	910	4.8	3.8	1.50	2.40	1.34	5.24	1.0	3.8	5.24

is, they dug one row at a time. The tractor diggers obtained the power to run the elevators by means of a power-take-off from the tractor. Some of the tractor machines were double units, that is, they dug two rows at a time. On many of the tractor diggers two men were used, one on the tractor and a second on the digger. This procedure applied especially to the double-unit diggers. With horses, digging an acre of potatoes required 5.3 hours in comparison with 3.8 hours with a tractor. The cost of labor, power, and equipment in digging with horses was \$6.53 per acre and with a tractor \$5.24 per acre (table 17).

Operations performed with horses or trucks. These operations include picking stones, hauling manure, hauling seed potatoes to the farm, hauling fertilizer to the farm, hauling seed potatoes and fertilizer to the field at planting, hauling water for spraying, hauling potatoes to farm storage, hauling potatoes to track storage, hauling potatoes sold from the field at digging, and hauling potatoes from farm storage to be sold. Potatoes in track storage, of course, were loaded directly onto the cars without further hauling by horses or trucks. The cost is computed on both a per acre and a ton-mile basis and includes time spent in loading and unloading as well as the return trip.

Of the total cost of labor, tractive power, and equipment in the work on potatoes that was done with horses or trucks, 71 per cent was for work done with trucks and 29 per cent for work done with horses. Of the total ton-miles of haulage, 96 per cent was with trucks and 4 per cent with horses. Horses were used more in picking stones and in hauling manure than were trucks and, although not as much as trucks, horses were still used to a considerable extent in hauling seed and fertilizer to the field and in hauling potatoes to farm storage. Horses were used relatively little in the other operations.

On a per acre basis the average cost of all hauling with horses was about one-fifth more than with trucks. The average cost of the various operations on a ton-mile basis was more than twice as large with horses as with trucks and for some operations ranged up to six times as large.

Two examples will serve to indicate the relative time and cost in doing work with horses and trucks.

In hauling seed potatoes and fertilizer to the field, the average time expended per acre was 1.0 hour with horses and 0.7 hour

with trucks. The average ton-miles per acre were 1.1 with horses and 1.8 with trucks. The average cost per acre with horses was 96 cents and with trucks 94 cents and the average cost per ton-mile with horses was 90 cents and with trucks 52 cents. In this operation much more time was expended in loading and

TABLE 18

Operations Performed with Horses or Trucks in Producing Potatoes in Southern Aroostook County, Maine, 1941

Operation and tractive power	Acres of potatoes	Hours per acre		Hours per acre hauling	Ton-miles per acre	Cost per acre (dollars)				Cost per ton-mile (dollars)
		Man	Tractive power			Man	Tractive power	Equipment	Total	
Picking stones:										
2 horses	3,745	3.1	3.2	1.6	1.7	1.01	.93	.15	2.09	1.23
1 truck	388	2.3	1.2	1.2	2.1	.74	.98	—	1.72	.82
Hauling manure:										
2 horses	738	12.5	16.0	8.0	6.1	4.06	4.05	1.03	9.14	1.51
1 truck	65	21.4	11.6	11.6	30.0	7.12	6.26	—	13.38	.45
Hauling seed to farm:										
2 horses	70	.9	1.5	.8	2.6	.31	.59	.09	.99	.38
1 truck	2,941	1.2	1.0	1.0	18.8	.38	.78	—	1.16	.06
Hauling fertilizer to farm:										
2 horses	105	1.1	1.8	.9	2.6	.33	.49	.08	.90	.34
1 truck	3,323	.9	.6	.6	12.5	.32	.56	—	.88	.07
Hauling seed and fertilizer to field:										
2 horses	1,250	1.0	2.0	1.0	1.1	.36	.53	.07	.96	.90
1 truck	3,030	.9	.7	.7	1.8	.32	.62	—	.94	.52
Hauling water for spraying:										
2 horses	71	1.6	3.3	1.6	4.0	.47	.72	.09	1.28	.32
1 truck	1,263	1.3	1.3	1.3	3.1	.45	.98	—	1.43	.46
Hauling potatoes to farm storage:										
2 horses	536	5.6	9.7	4.8	4.9	1.80	2.34	.21	4.35	.88
1 truck	1,315	5.2	3.5	3.5	8.5	1.75	2.24	—	3.99	.47
Hauling potatoes to truck storage:										
2 horses	27	6.5	13.0	6.5	1.6	1.72	3.06	.45	5.23	.32
1 truck	1,633	5.5	4.9	4.9	5.7	1.99	4.75	—	6.74	.12
Hauling potatoes sold from field:										
2 horses	15	16.3	22.5	11.2	16.7	4.84	5.68	.47	10.99	.66
1 truck	754	7.1	6.5	6.5	60.0	2.29	5.37	—	7.66	.13
Hauling potatoes from farm storage:										
2 horses	38	12.3	24.4	12.2	32.3	4.21	3.82	.51	8.54	.26
1 truck	1,554	9.5	7.6	7.6	86.2	2.98	4.35	—	7.33	.08

unloading than in actual travel because of the relatively short hauls into the potato fields.

In hauling potatoes from farm storage to the railroad, the average time expended per acre was 12.2 hours with horses and 7.6 hours with trucks. The ton-miles per acre averaged 32.3 with horses and 86.2 with trucks. The distances hauled were longer with trucks than with horses. The cost of performing this operation with horses was \$8.54 per acre or 26 cents per ton-mile and with trucks \$7.33 per acre or 8 cents per ton-mile.

The details of time and cost for the various operations involving horses and trucks are shown in table 18.

Seed potatoes planted

Seed potatoes planted ranged from 5 to 10 barrels per acre. The average planting was 7.5 barrels per acre costing \$1.70 per barrel. The seed-potato cost per acre was \$12.76 and the cost of seed potatoes per barrel of potatoes grown was 12 cents.

Of the total potato acreage, 65 per cent was planted with certified seed, 15 per cent with selected seed, and 20 per cent with common seed. Certified seed had passed State inspection for relative freedom from disease. Selected seed was grown from certified seed but was not itself certified. All other seed potatoes planted were characterized as common seed.

A somewhat larger amount of certified seed potatoes was planted per acre than of either selected or common. The average planting of certified seed was 7.6 barrels per acre, of selected seed 7.4 barrels, and of common seed 7.2 barrels. Certified potatoes for seed were valued at \$1.77 per barrel, selected seed at \$1.54 per barrel, and common seed at \$1.57 per barrel. The cost of certified seed potatoes per acre planted averaged \$13.50, of selected seed \$11.39, and of common seed \$11.35. A considerable portion of the potatoes planted, especially selected seed, consisted of potatoes not quite suitable for the commercial market because of size but nevertheless entirely fit for seed. The market value of such potatoes was considerably less than for "regular" seed. As a general rule, planting the better quality of seed potatoes was associated with high yield rates and low cost of production (table 19).

TABLE 19

*Seed Potatoes of Various Qualities and Varieties Planted in Southern
Aroostook County, Maine, 1941*

Item	Acres of potatoes	Per cent of acres	Barrels planted per acre	Cost (dollars)	
				per barrel	per acre
Certified seed					
Katahdin	1,468	52.6	7.7	1.73	13.27
Green Mountain	718	25.7	7.5	1.66	12.47
Houma	214	7.7	8.0	2.08	16.70
Earlaine	67	2.4	7.9	2.28	18.09
Irish Cobbler	116	4.2	7.3	1.52	11.13
Sebago	109	3.9	7.5	2.49	18.65
Other	97	3.5	7.2	1.58	11.31
All certified seed	2,789	100.0	7.6	1.77	13.50
Selected seed					
Katahdin	273	42.5	7.5	1.70	12.85
Green Mountain	202	40.8	7.4	1.41	10.45
Houma	9	1.4	8.2	1.72	14.18
Earlaine	42	6.6	7.2	1.61	11.63
Irish Cobbler	14	2.2	6.9	1.13	7.82
Sebago	13	2.0	7.0	1.25	8.75
Other	29	4.5	6.8	1.17	7.94
All selected seed	642	100.0	7.4	1.54	11.39
Common seed					
Katahdin	432	50.9	7.1	1.63	11.58
Green Mountain	223	26.3	7.4	1.31	9.62
Houma	5	.6	6.8	1.35	9.20
Earlaine	98	11.5	7.4	1.74	12.80
Irish Cobbler	34	4.0	7.1	1.16	82.25
Sebago	13	1.5	7.5	2.52	18.82
Other	44	5.2	7.1	2.12	15.02
All common seed	849	100.0	7.2	1.57	11.35
All seed					
Katahdin	2,173	50.8	7.5	1.71	12.88
Green Mountain	1,203	28.1	7.5	1.54	11.50
Houma	228	5.3	8.0	2.05	16.44
Earlaine	207	4.8	7.5	1.90	14.27
Irish Cobbler	164	3.8	7.2	1.42	10.24
Sebago	135	3.2	7.4	2.38	17.77
Other	170	4.0	7.1	1.65	11.70
Total or average	4,280	100.0	7.5	1.70	12.76

Fertilizer

Fertilizer was applied to potatoes at the average rate of 0.9 ton per acre. The cost of fertilizer was \$34.32 per acre or 32 cents per barrel of potatoes produced. The average cost per ton of fertilizer was \$38.19.

Fertilizers of 22 different formulas were used but two-thirds of the potato acreage was planted with the three formulas, 5-8-10.

8-16-20, and 5-8-12. Of the total potato acreage, 5-8-10 fertilizer was applied to 30.5 per cent, 8-16-20 to 20.4 per cent, and 5-8-12 to 16.0 per cent. In these formulas the figures refer to the per cent of nitrogen, phosphoric acid, and potash, respectively (table 20).

TABLE 20

*Fertilizers of Various Formulas Applied to Potatoes in Southern
Aroostook County, Maine, 1941*

Formula†	Number* of farms	Acres of potatoes fertilized	Total tons of fertilizer	Dollars cost of fertilizer	Per cent of total		
					Acres of potatoes	Tons fertilizer	Cost of fertilizer
5- 8-10	51	1,308	1,4 ⁹²	47,361	30.5	37.3	32.3
8-16-20	45	872	511	27,081	20.4	13.3	18.4
5- 8-12	35	686	716	24,654	16.0	18.6	16.8
5- 9- 8	23	312	330	11,012	7.3	8.6	7.5
8-16-16	14	249	149	7,430	5.8	3.9	5.1
6-10-14	6	181	136	5,624	4.2	3.5	3.8
7-14-21	9	135	98	4,150	3.2	2.5	2.8
4- 8-10	7	107	120	3,960	2.5	3.1	2.7
7-12-14	4	106	92	4,351	2.5	2.4	3.0
10-16-24	5	70	44	2,696	1.6	1.1	1.8
8-16-14	4	58	33	1,587	1.3	.9	1.1
5- 9-12	2	50	50	1,999	1.2	1.3	1.2
5- 8- 7	3	42	42	1,368	1.0	1.1	.9
Other	9	109	91	3,858	2.5	2.4	2.6
Total		4,280	3,844	146,830	100.0	100.0	100.0

† Per cent of nitrogen, phosphoric acid, and potash, respectively.

* On many farms more than one formula was used.

Fertilizer of such a formula as 5-8-10 was called single-strength in comparison with 8-16-20 which was called double-strength. The single-strength fertilizer was applied to 59 per cent of the potato acreage and the double-strength to 41 per cent. The approximate average formula of the single-strength fertilizer was 5-8-10 and of the double-strength 8-14-18. The double-strength fertilizer had some advantages compared with the single-strength. For the same amount of plant food there was, of course, a saving in hauling cost and in labor. Although slightly more total plant food (nitrogen, phosphoric acid, and potash) was applied per acre of the double-strength fertilizer, the cost per acre was less than in the case of the single-strength.

On the average, one ton of single-strength fertilizer contained 460 pounds of plant food consisting of 100 pounds of nitrogen, 160 pounds of phosphoric acid, and 200 pounds of potash. In compari-

son, one ton of double-strength fertilizer contained 800 pounds of plant food consisting of 160 pounds of nitrogen, 280 pounds of phosphoric acid, and 360 pounds of potash.

The total amount of nitrogen, phosphoric acid, and potash applied per acre of potatoes averaged 503 pounds for the single-strength fertilizer and 517 pounds for the double-strength. The application per acre of double-strength in comparison with the single-strength averaged 8 pounds less of nitrogen but 12 pounds more of phosphoric acid and 10 pounds more of potash.

The cost per hundredweight of the nitrogen, phosphoric acid, and potash in the single-strength fertilizer averaged \$7.16 and of the double-strength \$6.15, a difference of \$1.01 in favor of the double-strength. As applied, the cost per acre of the nitrogen, phosphoric acid, and potash was \$36.01 for the single-strength and \$31.80 for the double-strength, a difference of \$4.21 per acre in favor of the double-strength (table 21).

TABLE 21

Single-Strength and Double-Strength Fertilizers Applied to Potatoes in Southern Aroostook County, Maine, 1941

Item	Single-Strength	Double-Strength
Number of farms	124	93
Per cent of potato acreage	59	41
Approximate average formula	5-8-10	8-14-18
Pounds per ton of fertilizer of:		
Nitrogen	100	160
Phosphoric acid	160	280
Potash	200	360
Total	460	800
Cost per hundredweight of total nitrogen, phosphoric acid, and potash (dollars)	7.16	6.15
Pounds applied per acre of potatoes of:		
Nitrogen	106	98
Phosphoric acid	175	187
Potash	222	232
Total	503	517
Cost per acre of total nitrogen, phosphoric acid, and potash (dollars)	36.01	31.80

Barnyard manure and green-manure crops

Barnyard manure and green-manure crops were applied to 20.6 per cent and 9.1 per cent of the potato acreage, respectively.

The average application of barnyard manure was 8.5 tons per acre and the average value of the manure was \$17.89 per acre. The farmers' estimates of the value per ton of the manure spread on the land averaged \$2.10. The average application of green-manure crops was 1.3 tons of hay-dry material per acre valued at \$7.07. The farmers' estimates of the hay value of the green-manure crops averaged \$5.56 per ton of dry material (table 22).

TABLE 22

Barnyard Manure and Green-Manure Crops Applied to Potatoes in Southern Aroostook County, Maine, 1941

Item	Acres of potatoes manured	Per cent of total potato acreage manured	Tons of manure per acre manured	Value of manure per acre manured (dollars)	Value of manure per ton (dollars)
Barnyard manure	880	20.6	8.5	17.89	2.10
Green-manure crops	389	9.1	1.3*	7.07	5.56

* Farmers' estimates of amount of hay-dry material.

† Farmers' estimates of value per ton in field.

The crops used for green manure were largely red clover, mixed hay, and crimson clover. Of the total acres of green-manure crops, 53.4 per cent was red clover, 22.4 per cent mixed hay, and 21.6 per cent crimson clover. The amount of hay-dry material per acre averaged 1.7 tons for crimson clover, 1.4 tons for red clover, and 0.5 ton for mixed hay (table 23).

TABLE 23

Crops Used for Green Manure in Southern Aroostook County, Maine, 1941

Item	Acres of green manure	Per cent of green manure acreage	Tons* per acre
Red Clover	208	53.4	1.4
Mixed hay	87	22.4	.5
Crimson Clover	84	21.6	1.7
Other	10	2.6	2.0
Total	389	100.0	

* Farmers' estimates of amount of hay-dry material.

Spray and dust

Home-mixed bordeaux applied as a wet spray was the most common control measure for late blight. Wet spray was used on 61.2 per cent of the potato acreage and copper-lime dust on 38.8 per cent. Insecticides, mostly calcium arsenate, were applied to practically all (99.8 per cent) of the potato acreage. The 61.2 per cent of the potato acreage receiving wet spray was composed of 44.1 per cent home-mixed bordeaux, 14.8 per cent basic copper, and 2.3 per cent other wet sprays. Potatoes were sprayed an average of 4.7 times or dusted an average of 4.5 times. Insecticides were applied an average of 1.9 times (table 24). The range in the number of fungicidal applications was 2 to 8 and of insecticidal 0 to 6.

TABLE 24

*Application of Fungicides and Insecticides to Potatoes in
Southern Aroostook County, Maine, 1941*

Item	Aeres of potatoes	Per cent of acres	Average number of applications
Fungicide:			
Home-mixed bordeaux	1,885	44.1	4.6
Basic copper	635	14.8	4.9
Other wet sprays	98	2.3	4.9
Copper-lime dust	1,662	38.8	4.5
Total fungicides	4,280	100.0	4.6
Insecticides*	4,272	99.8	1.9

* Insecticides (mostly calcium arsenate) were applied mixed with spray or dust to control "potato bugs."

The most common home-mixed bordeaux applied contained 10 pounds of blue vitriol and 10 pounds of spray lime to 100 gallons of water. Of the farmers using home-mixed bordeaux, 64 per cent used this 10-10-100 mixture. Of the other mixtures used most contained less spray lime than blue vitriol. The amount of vitriol used per 100 gallons of water ranged from 5 pounds to 12 pounds and the amount of spray lime from 5 pounds to 20 pounds.

Of basic copper, the most common amounts used with 100 gallons of water were 4, 5, and 6 pounds. Each of these amounts was used on 27 per cent of the farms. On the remaining 19 per cent of

the farms the amounts ranged from 7 to 12 pounds per 100 gallons of water.

Calcium arsenate was used at the rate of 6 pounds per 100 gallons of water on 43 per cent of the farms on which calcium arsenate was applied in a wet spray, 4 pounds per 100 gallons on 32 per cent, and 5 pounds per 100 gallons on 14 per cent. The smallest amount of calcium arsenate used per 100 gallons of water was 3 pounds and the largest amount 12 pounds.

The bordeaux spray applied to potatoes contained, on the average, 9.2 pounds of blue vitriol and 8.3 pounds of spray lime. The cost of these materials per acre averaged 63 cents, 53 cents for the vitriol and 10 cents for the lime. In the case of basic copper, the average application was 5.5 pounds per acre and the average cost 79 cents per acre. The insecticide (mostly calcium arsenate) was applied in most cases with the first one or two sprayings. The average amount of insecticide was 5.4 pounds per acre and the average cost was 43 cents.

Copper-lime dust used for the first two applications usually contained an insecticide. This dust was applied at the average rate of 30 pounds per acre and cost 4.3 cents per pound. The cost of one application was \$1.29 per acre. Copper-lime dust without the insecticide cost 3.4 cents per pound and was applied at the aver-

TABLE 25

*Materials Used in Spraying and in Dusting Potatoes in Southern
Aroostook County, Maine, 1941*

Material	Pounds per acre for one application	Price in cents per pound	Cost in cents per acre for one application
Home-mixed bordeaux:			
Blue vitriol	9.2	5.8	53
Spray lime	8.3	1.2	10
Total or average	17.5	3.6	63
Basic copper	5.5	14.3	79
Other wet spray	—	—	72
Insecticide*	5.4	7.9	43
Copper-lime dust:			
With insecticide	30	4.3	129
Without insecticide	31	3.4	106

* Largely calcium arsenate.

age rate of 31 pounds per acre. The cost of one application was \$1.05 per acre (table 25).

The cost of materials, labor, tractive power, and equipment in spraying was slightly more per application than the comparable cost in dusting, \$2.06 per acre for spraying and \$1.87 per acre for dusting. The average cost of the materials for dusting was considerably more than for the spraying, \$1.23 per acre compared with 83 cents. However, the cost of labor, tractive power, and equipment each was nearly twice as large for spraying as for dusting. The respective costs in spraying and dusting per acre for one application were: man labor 37 cents and 19 cents, tractive power 54 cents and 29 cents, and equipment 32 cents and 16 cents (table 26).

TABLE 26

Comparison of the Cost of Spraying and of Dusting Potatoes in Southern Aroostook County, Maine, 1941

Item	Cost per acre for one application (cents)		Per cent of cost	
	Spraying	Dusting	Spraying	Dusting
Materials	83	123	40.3	65.8
Man labor	37	19	18.0	10.1
Tractive power	54	29	26.2	15.5
Equipment*	32	16	15.5	8.6
Total	206	187	100.0	100.0

* Sprayers, dusters, and mixing equipment.

Storage space

Potatoes were stored at the farms and at railroad sidings. Farm storage was nearly all in houses constructed especially for the purpose although a limited amount of potatoes was stored in dwelling-house cellars. Track-side storage consisted of especially built houses located on the railroad.

Of the potatoes produced, about 83 per cent were placed in storage. The remainder was sold directly from the field at the time of digging. On the 172 farms represented, 387,214 barrels of potatoes were placed in storage. Of these, slightly less than one-half (49.7 per cent) were placed in farm storage and slightly more than one-half (50.3 per cent) were placed in track storage. The storage

loss in farm storage amounted to 9.7 per cent of the potatoes placed in storage and in track storage 10.6 per cent. The average for all potatoes placed in storage was 10.1 per cent. Storage loss was mostly from loss of moisture but included also some loss due to spoilage. Storage loss, as computed, was the difference between the amount of potatoes placed in storage and the amount taken out.

TABLE 27

Farm and Track Storage of Potatoes in Southern Aroostook County, Maine, 1941

Kind of storage	Barrels of potatoes stored	Per cent of stored potatoes	Per cent loss in storage	Cost of storage space per barrel (cents)
Farm	192,355	49.7	9.7	5.6
Track	194,859	50.3	10.6	14.0
Total or average	387,214	100.0	10.1	9.8

The cost of farm storage included the operation and maintenance cost of that part of the building used for potatoes. In the case of track storage the cost was mostly at a flat rate per barrel although a few of the farmers had their own track-side houses. The average cost of storage per barrel stored was 9.8 cents. The cost in farm storage was 5.6 cents per barrel and in track storage 14.0 cents per barrel (table 27).

TABLE 28

Storage Loss of Different Varieties of Potatoes in Southern Aroostook County, Maine, 1941

Variety	Barrels of potatoes stored	Storage loss (barrels)	Per cent loss	Number of farms
Katahdin	204,651	19,456	9.5	148
Green Mountain	105,482	11,452	10.9	116
Houma	22,565	2,450	10.9	37
Earlaine	19,239	1,911	9.9	37
Other varieties*	35,277	3,963	10.1	86

* Less than 15,000 barrels of one variety.

Storage loss of different varieties of potatoes. Potatoes, on the 172 farms, placed in storage in amounts exceeding 15,000 barrels were: Katahdin, Green Mountain, Houma, and Earlane. Under the conditions in which they were stored, the storage loss on Green Mountain and Houma was, in each instance, 10.9 per cent of the potatoes placed in storage. In the case of Earlane the storage loss was 9.9 per cent and of Katahdin 9.5 per cent. The storage losses of the various varieties are indicated in table 28.

Barrels

Barrels were used in planting, storing, and selling potatoes. The number of barrels used, however, depended on the needs for hauling potatoes at the time of digging. Barrels are filled in the field, hauled away to be emptied, and then returned to the field many times during the digging season. The cost of barrels was prorated to planting, storing, and selling in accordance with the number of man hours expended on the various operations in which barrels were used. On the average, 4.0 barrels per acre of potatoes were on hand before harvest began. The average value per barrel was 64 cents. At the end of the season the number was reduced to an average of 2.8 per acre valued at 52 cents each. The cost for barrels averaged \$1.10 per acre. During the season 30.1 per cent of the barrels were discarded because of wear and tear.

Indirect cost

The indirect cost is made up of the cost for the use of land, interest, and other cost items not otherwise considered. The land use cost which includes taxes and interest on the value of the land aver-

TABLE 29

*Indirect Cost in Producing Potatoes in Southern
Aroostook County, Maine, 1941*

Item	Cost per acre (dollars)	Cost per barrel (cents)
Land use	3.78	3.5
Interest	2.45	2.2
Other	.23	.2
Total	6.46	5.9

aged \$3.78 per acre of potatoes or 3.5 cents per barrel. Interest and other costs averaged \$2.45 and 23 cents per acre, respectively, and 2.2 cents and 0.2 cent per barrel, respectively (table 29).

FACTORS AFFECTING THE COST OF PRODUCTION

The cost of potato production is influenced by the size of the enterprise, the yield rate, the efficiency in the use of labor, and the efficiency in the use of capital.

Size of enterprise

Large farm businesses have advantages over small farm businesses that appear to be inherent in size. With the large size of business are associated high yield rates, efficient use of labor, and efficient use of capital.

Of the farms represented, those with less than 15 acres of potatoes per farm had an average yield rate of potatoes of 98 barrels per acre. On the farms with 30 or more acres of potatoes per farm, the yield rate of potatoes averaged 111 barrels per acre. The hours of man labor per acre of potatoes on the small farms averaged 91 compared with 72 on the large farms. The average value of tractive power and equipment per acre of potatoes on the small farms was \$76 and on the large farms \$47. The value of cropland per acre on the small farms averaged \$43 compared with \$55 on the large farms. Part of this increase in valuation of cropland was probably due to better soil and part to better location. Quality of soil, of course, is related to yield rate.

As a result of the greater efficiencies on the large farms the cost of potato production was less on these farms than on the small farms. The total production cost per acre was \$149 on the large farms compared with \$167 on the small farms. For just growing and harvesting the cost on the large farms was \$108 per acre and on the small farms \$130 per acre. Total production cost per barrel averaged \$1.34 on the large farms and \$1.70 on the small farms while for growing and harvesting this cost averaged 92 cents and \$1.33 on the large and small farms, respectively (table 30).

In the following three sections which discuss the effect of yield rate, labor efficiency, and capital efficiency on the cost of producing potatoes, the influence of size of business is in a measure eliminated.

TABLE 30

*Relation of Potato Acreage to Production Factors and Cost in Southern
Aroostook County, Maine, 1941*

Item	Acres of potatoes per farm		
	Less than 15.0	15.0-29.9	30.0 or more
Number of farms	50	71	51
Average acres of potatoes	11	21	44
Yield per acre (barrels)	98	108	111
Total hours of man labor per acre	91	81	72
Hours of man labor per acre growing and harvesting	85	75	63
Value of tractive power and equipment per acre (dollars)	76	66	47
Value of cropland per acre	43	50	55
Total production cost per acre (dollars)	167	161	149
Cost per acre growing and harvesting (dollars)	130	120	108
Total production cost per barrel (cents)	170	149	134
Production cost per barrel growing and harvesting (cents)	133	111	92

The effect of these three factors on cost of production is indicated for farms having less than 20 acres of potatoes per farm (small farms) and farms having 20 or more acres of potatoes per farm (large farms). This procedure is feasible because, even though large size of business is in general associated with large yield rates, good labor efficiency, and good capital efficiency, many small farms were high in these respects and many large farms were low.

Yield rate of potatoes

Yield rate is an important factor influencing the cost of producing potatoes on both small and large farms. Of the small farms (those having less than 20 acres of potatoes per farm) 20 per cent had yield rates of 116 or more barrels per acre. On the other hand, 19 per cent of the large farms (those having 20 or more acres of potatoes) had yield rates of less than 96 barrels per acre.

On both small and large farms the cost per acre increased as the yield rate increased but the cost per barrel decreased. The cost per

acre increased largely because of the added cost of handling the larger quantity of potatoes and because of the added expense in planting both a larger quantity and a better quality of seed. On the small farms, when the yield rate of potatoes was less than 96 barrels per acre, the production cost averaged \$163 per acre and \$2.06 per barrel. However, when the yield rate was 116 or more barrels per acre, the production cost was \$197 per acre but \$1.52 per barrel. Similarly, on the large farms with the low yield rate the production cost was \$143 per acre and \$1.63 per barrel while on the large farms with the high yield rate, the cost was \$160 per acre but \$1.24 per barrel (table 31).

TABLE 31

Relation of Yield Rate to the Cost of Producing Potatoes on Small and Large Farms in Southern Aroostook County, Maine, 1941

Acres of potatoes per farm and Barrels of potatoes per acre	Number of farms	Average acres of potatoes per farm	Average barrels of potatoes per acre	Cost of production per acre (dollars)	Cost of production per barrel (dollars)
Less than 20 acres:					
Less than 96 barrels	33	12	81	163	2.06
96 - 115 barrels	34	14	106	154	1.46
116 or more barrels	17	15	130	197	1.52
20 or more acres:					
Less than 96 barrels	17	36	88	143	1.63
96 - 115 barrels	39	33	107	150	1.40
116 or more barrels	32	38	129	160	1.24

Labor efficiency

Labor efficiency depends in large measure on the kind of tractive power and equipment used and on the size of the fields. As already noted, in general, work was accomplished in less time with tractors and trucks than with horses. On large fields compared with small fields, time saved in turning made for more efficient use of labor. Large fields and power equipment were both more prevalent on large than on small farms.

However, on 15 per cent of the small farms less than 65 hours of man labor were expended per acre in growing and harvesting potatoes while on 12 per cent of the large farms the man labor expended was 85 or more hours per acre.

Increased man labor efficiency was accompanied by decreased cost of potato production on both small and large farms. On the farms having less than 20 acres of potatoes per farm the potato-production cost per acre was \$177 when man hours were 85 or more per acre, and \$150 per acre when man hours were less than 65 per acre. The production cost per barrel in the first instance was \$1.91 and in the second \$1.61.

In like manner, on the large farms the low labor efficiency (85 or more man hours per acre) was accompanied by a per-acre cost of \$175 compared with \$142 for farms with high labor efficiency (less than 65 man hours per acre). The corresponding costs per barrel were \$1.54 and \$1.30 (table 32).

TABLE 32

Relation of Labor Efficiency to the Cost of Producing Potatoes on Small and Large Farms in Southern Aroostook County, Maine, 1941

Acres of potatoes per farm and Man hours per acre	Number of farms	Average acres of potatoes per farm	Average man hours per acre*	Cost of production per acre (dollars)	Cost of production per barrel (dollars)
Less than 20 acres:					
Less than 65 hours	13	15	56	150	1.61
65 - 84 hours	37	14	76	162	1.55
85 or more hours	34	12	99	177	1.91
20 or more acres:					
Less than 65 hours	42	40	55	142	1.30
65 - 84 hours	35	33	73	156	1.44
85 or more hours	11	28	95	175	1.54

* Man hours per acre expended in growing and harvesting.

Capital efficiency

One measure of capital efficiency in potato production is the value of tractive power and equipment per acre of potatoes. A certain minimum investment in power and machinery is necessary in commercial potato production even on small acreages. In the use of tractive power we have seen that the potato acreage cared for with a pair of horses varied from 7 to 24 acres and with a pair of horses, a tractor, and a truck from 12 to 52 acres. Even on the larger farms the potato acreage operated by two units of power and equipment may be such that the second unit is working at much less than its optimum capacity. The tendency on the Southern Aroos-

took farms, as shown, was toward relatively large investments in power and equipment per acre of potatoes especially on the smaller acreages.

However, 17 per cent of the small farms had relatively good capital efficiency, that is, the value of power and equipment was less than \$46 per acre. On the other hand, 19 per cent of the large farms had relatively poor capital efficiency, that is, the value of power and equipment was \$66 or more per acre.

On small farms as well as large the potato-production cost tended to increase as the value of tractive power and equipment per acre of potatoes increased. On the small farms, a value of power and equipment of less than \$46 per acre was accompanied by a production cost per acre of \$154 and per barrel of \$1.74. When the value of power and equipment was \$66 or more per acre, the production cost was \$178 per acre and \$1.80 per barrel. Of the large farms, those having the relatively good capital efficiency had a production cost of \$142 per acre and \$1.35 per barrel, while those having the relatively poor capital efficiency had a production cost of \$160 per acre and \$1.51 per barrel (table 33).

TABLE 33

Relation of Capital Efficiency to the Cost of Producing Potatoes on Small and Large Farms in Southern Aroostook County, Maine, 1941

Acres of potatoes per farm and Value of power and equipment per acre (dollars)	Number of farms	Average acres of potatoes per farm	Average value of power and equipment (dollars)	Cost of production	
				Dollars per acre	Dollars per bbl.
Less than 20 acres:					
Less than \$46	14	14	35	154	1.74
\$46 - \$65	29	14	54	157	1.56
\$66 or more	41	13	100	178	1.80
20 or more acres:					
Less than \$46	31	42	30	142	1.35
\$46 - \$65	40	35	54	156	1.36
\$66 or more	17	26	85	160	1.51

SUMMARY

The information presented has to do with potato farming in Aroostook County south of Mars Hill and shows (1) the crops, livestock, and tractive power on the farms, (2) the application and cost of labor, tractive power, and equipment for the various operations in potato production, the amount and cost of materials, and the indirect costs, and (3) factors that affect cost such as size of the potato enterprise, man hours of labor per acre, and the value of tractive power and equipment per acre.

The size of farm averaged 171 acres about one-half of which was cropland and one-third woodland. Most of the remainder was pasture. Small farms had a larger percentage of the farmland in cropland and pasture than did the large farms.

Acres of crops averaged 84 per farm including 25 acres of potatoes, 18 acres of grain (mostly oats), and 35 acres of hay. The remaining 6 acres was largely green manure crops, factory peas, and rotated pasture. The Katahdin and Green Mountain varieties made up about four-fifths of the potato acreage. Other varieties produced were: Houma, Earlane, Irish Cobbler, Chippewa, Sebago, Russet Rural, and Warba.

The livestock was 74 per cent dairy animals. The remainder was beef animals, swine, poultry, and sheep. Dairy cows averaged 5 per farm and the total animal units 8.5 per farm. Acres of pasture per animal unit of livestock pastured averaged 2.7, considerably less than the 4-acre average of the dairy areas of the State.

Tractive power includes horses, trucks, and tractors. Of the total farms, 92 per cent used horses, 67 per cent trucks, and 60 per cent tractors. The most common unit of tractive power was composed of 2 horses, 1 general-purpose tractor, and 1 truck. With this unit, the potato acreage averaged 32 acres. The next most common unit of power was 2 horses. With this unit there was an average of 13 acres of potatoes per farm. Six per cent of the farms operated with 1 general-purpose tractor and 1 truck. These farms had an average of 32 acres of potatoes. The potato acreage operated with 2 horses varied from 7 acres to 24 acres and with 2 horses, 1 general-purpose tractor, and 1 truck from 12 acres to 52 acres.

The production cost averaged \$154 per acre or \$1.41 per barrel of which 63 per cent was for growing the crop, 11 per cent for harvesting, 23 per cent for storing, and 3 per cent for selling.

Labor, tractive power, and equipment cost \$63 per acre. Man hours averaged 83, horse hours 47, truck hours 9, and tractor hours 6. For the operations performed by man labor, mixing fertilizer required 4 hours per acre, treating seed 1 hour, cutting seed 6 hours, hand hoeing 5 hours, roguing 8 hours, picking up 21 hours, storage care 5 hours, and grading 22 hours. A comparison of horses and tractors shows that, in general, work is done on potatoes more quickly and at less expense with tractors than with horses. For example, in planting an acre of potatoes 3.1 hours were expended with horses compared with 1.5 hours with tractors. The cost per acre of labor, power, and equipment with horses was \$3.97 compared with \$2.75 with tractors. A comparison of horses and trucks shows that for nearly all work on potatoes, hauling with trucks not only required less time per acre than hauling with horses but the cost of labor, power, and equipment per acre and per ton-mile was less. As an example, in hauling potatoes from farm storage to the railroad 12 hours were expended per acre with horses compared with 8 hours with trucks. The cost per acre with horses was \$8.54 and with trucks \$7.33, while the cost per ton-mile was 26 cents with horses and 8 cents with trucks.

Seed potatoes were planted at the average rate of 7.5 barrels per acre valued at \$1.70 per barrel in 1941. Sixty-five per cent of the potato acreage was planted with certified seed.

Fertilizer was applied to potatoes at the average rate of 0.9 ton per acre and the average cost of \$34.32 per acre. Although fertilizers of 22 different formulas were used, the three formulas, 5-8-10, 8-16-20, and 5-8-12, accounted for two-thirds of the potato acreage. A comparison of single-strength and double-strength fertilizers indicates that the average application per acre of single-strength contained 8 pounds more of nitrogen but 12 pounds less of phosphoric acid and 10 pounds less of potash. For single-strength the cost per acre was \$36 compared with \$32 for the double-strength.

Spray and dust was applied to potatoes an average of 4.6 times. Wet spray was applied to 61 per cent of the potato acreage and copper-lime dust to 39 per cent. Bordeaux mixture was applied to 44 per cent of the acreage at the average rate of 9 pounds of blue vitriol and 8 pounds of spray-lime per acre. The cost of materials, labor, power, and equipment in spraying one acre once averaged \$2.06 and in dusting \$1.87.

Storage space at the farm cost, on the average, 6 cents per barrel and at the track side 14 cents per barrel. Eighty-three per cent of the potatoes produced were stored. About one-half of the stored potatoes were at the farms and one-half at the railroads. Storage loss amounted to about ten per cent of the potatoes placed in storage.

Barrels on hand before potato harvest averaged 4 per acre and the average value before harvest was 64 cents per barrel. At the end of the season the number averaged 2.8 per acre and the value 52 cents per barrel. The average cost for barrels was \$1.10 per acre.

Size of enterprise in general was directly correlated with yield rate of potatoes, labor efficiency, and capital efficiency. On farms having less than 15 acres of potatoes per farm, potato yield was 98 barrels per acre, hours of man labor 91, value of tractive power and equipment \$76, and value of cropland \$43. On the farms having 30 or more acres of potatoes per farm, the yield was 111 barrels per acre, hours of man labor 72, value of tractive power and equipment \$47, and value of cropland \$55. The potato production cost on the farms having less than 15 acres of potatoes per farm was \$167 per acre and \$1.70 per barrel, compared with \$149 and \$1.34, respectively, on the farms having 30 or more acres of potatoes.

Although in general large potato acreages were related to large yields of potatoes, efficient use of labor, and efficient use of capital, still many farms with small potato acreages were above average in these respects and many farms with large potato acreages were below average. Of the small farms (those having less than 20 acres of potatoes per farm) 20 per cent had potato yields of 116 or more barrels per acre; 15 per cent had less than 65 hours of man labor per acre in growing and harvesting potatoes; and 17 per cent had a value of tractive power and equipment of less than \$46 per acre. On the other hand, 19 per cent of the large farms (those with 20 or more acres of potatoes per farm) had yields of less than 96 barrels of potatoes per acre; 12 per cent had 85 or more hours of man labor per acre in growing and harvesting; and 19 per cent had a value of power and equipment of \$66 or more per acre.

As the yield rate of potatoes increased the production cost per acre also increased on both small and large farms but the cost per barrel decreased. On the small farms when the yield rate was low (less than 96 barrels per acre) the production cost was \$163 per acre and \$2.06 per barrel. On the other hand, when the yield rate

was high (116 or more barrels per acre) the cost was \$197 per acre and \$1.52 per barrel. Corresponding cost figures for the large farms were \$143 and \$1.63 for the low yield rate and \$160 and \$1.24 for the high yield rate.

Labor efficiency on both small and large farms was directly related to the production cost per acre and per barrel. On the small farms the production cost per acre increased from \$150 when the man hours expended in growing and harvesting were less than 65 per acre to \$177 when the man hours were 85 or more per acre and the cost per barrel increased from \$1.61 to \$1.91. On the large farms the production cost per acre increased from \$142 when labor efficiency was high to \$175 when labor efficiency was low while the cost per barrel increased from \$1.30 to \$1.54.

Capital efficiency was measured by the value of tractive power and equipment per acre of potatoes. On the small farms the potato-production cost per acre increased from \$154 when the value of tractive power and equipment was less than \$46 per acre to \$178 when this value was \$66 or more per acre while the cost per barrel increased from \$1.74 to \$1.80. On the large farms the cost per acre increased from \$142 when the capital efficiency was high to \$160 when the capital efficiency was low and the cost per barrel increased from \$1.35 to \$1.51.

BULLETIN 433

KEROSENE BURNERS IN A WOOD COOKSTOVE¹

MERNA M. MONROE

Some homemakers are well satisfied with the convenience and the performance of oil burners installed in their wood or coal ranges. Others complain that these burners do not give enough heat. A kitchen range can be made hotter with the use of wood than is possible with the oil burners now available on the market. However, suitable burners, properly installed, will give enough heat for household cooking.

The extent to which various conditions might affect stove temperatures was measured in the laboratory and is briefly reported herein. Since details of installation greatly affect the performance of these burners, homes were visited to note which details were frequently overlooked.

INSTALLATION OF BURNERS

The time required for the kerosene to flow into the burners and the final height to which the kerosene will rise in each bowl depends upon the height at which the reservoir is placed in relation to the height of the burner bowls. When a valve is opened, the kerosene rises in the cold burner bowl until it is on the same level as the top of the kerosene in the reservoir; it will rise no further than this. See Fig. 1.

When the kerosene reservoir is placed far too high, the kerosene will rise to the top of the bowls and spill over. Even though there is no flooding, the reservoir may still be too high for normal operation. The homemaker can easily estimate whether the reservoir is too high by noting the time required to saturate the asbestos rings when the valves are first turned on at lighting, and by noting

¹ A manuscript, "Performance analysis of wood cookstoves heated by kerosene burners," which contains descriptions of test procedures, detailed data and their significance is available at the University of Maine Library. Those interested may obtain a copy on a loan basis.

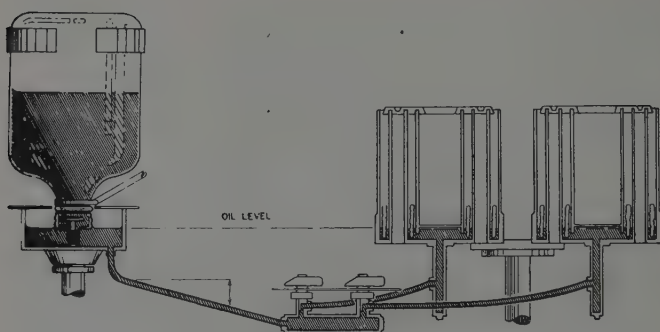


FIG. 1. Observe that the top of the kerosene in the reservoir is at the same level as the top of the kerosene in the burner bowls. If the bottle stand is adjusted higher so that the top of the kerosene in the reservoir (not the bottle) is on the same level as the top rim of the burner bowls, the kerosene will rise to the top of the bowls and spill over.

the valve setting used to maintain a moderately high blue flame. Normally, about 3 minutes is required to saturate the lighting rings; if the reservoir is too high, the lighting rings may be saturated within a minute or less. And normally, a valve setting of around #6 gives a moderately high blue flame; if the reservoir is too high, valve settings of #2 or #3 may be sufficient to give such a flame and it will be impossible to obtain very low flames.

The manufacturer generally recommends a depth of $\frac{3}{16}$ to $\frac{1}{4}$ of an inch of kerosene in the cold burner bowl. To determine this, remove the burner sleeves and the lighting rings, turn the valve wide open and allow the kerosene to flow into the burner for at least 15 minutes, then measure the depth of kerosene in the burner. If the depth is greater than $\frac{1}{4}$ inch, turn off the valve, remove the kerosene in the bowl, lower the kerosene reservoir a distance equal to the depth measured in the bowl minus the depth of kerosene desired. Again, open the valve wide and wait 15 minutes for the kerosene to rise to its final height. Then the kerosene may be measured to see if the desired $\frac{1}{4}$ inch depth has been obtained.

A very low draft, 0.01 to 0.03 inch of water, is sufficient when kerosene is burned. The amount of draft through a given stove depends upon the size, height, and condition of the chimney and upon whether there are openings into the same flue passage for

other stoves.² The dealer should measure the draft with a draft gauge when he installs the burners. A solid pipe damper instead of an open-center one may be sufficient in some cases to reduce the draft low enough for oil burners. An automatic draft regulator may be installed instead of the pipe damper. If a high draft cannot be reduced sufficiently with the regulator, the solid damper is sometimes inserted above the automatic regulator, or two regulators are installed.

Very few of the homes visited had the automatic regulator. In most of these homes the stovepipe damper was kept almost entirely closed while one burner was operated on a moderately high blue flame. The homemakers did not know whether the pipe damper was a solid or an open-center type.

The homemaker can estimate very roughly whether there is too much or not enough draft by noting the appearance of the flames. If there is far too much draft the flames will appear hard, sharp or clear-cut, and short. If there is not enough draft the flames will be soft, wobbly, yellow, and sooty. In order to provide as much heat as possible and still obtain complete burning of the kerosene, the dampers should be closed enough to give what is called a lazy flame.

If the flue passage above or below the oven is too high, the dealer may install a very thick layer of non-combustible material to make this passage shallow. This material may be laid on top of the oven or on the bottom of the flue passage under the oven. Sometimes sand is added to the passage under the oven. If the baffle under the oven is short and slants towards the front, the dealer may add a strip of non-combustible material to extend the baffle to within about three inches of the front of the stove. See Fig. 3, page 279, for short baffle under the oven.

An excess of cold air circulating around the outside of the burner sleeves cools them; as a result the kerosene is not completely burned. Therefore, precautions should be taken to protect the burners from too much of this cool air. The air needed for complete burning is mostly that which rises *between* the sleeves of each burner. The burners installed should be of a size to leave about 1 inch of free space between the burner sleeves and the fire-

² See United States Department of Agriculture Farmers' Bulletin 1649, "Construction of chimneys and fireplaces."

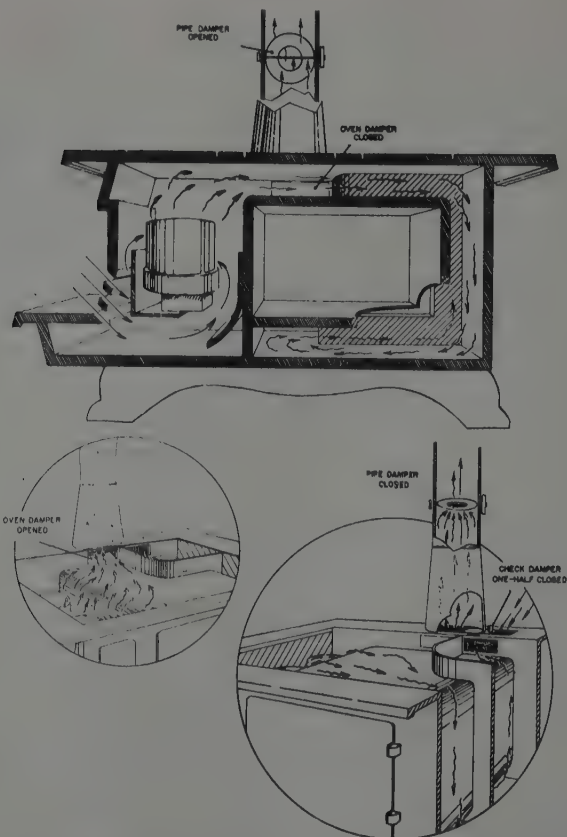


FIG. 2. Drawing of cast-iron range to show the flow of air above and below the oven and to show the effect of damper regulation on the flow of air through the stove. Note the long path of travel caused by the presence at the top of the oven of the curved flue strip which continues as a dividing plate down the side and under the oven. Room air enters through the ashpit damper opening; the heated air flows across the top of the oven (except right-rear section), down the front half of the side of the oven, and under the front half of the oven; this air then flows under rear half of the oven, up the rear half of the side, and across the top of a corner of the oven; thence, the air enters the box at the base of the stovepipe where it can be mixed with room air if the check damper is partially closed.

Opening the oven damper allows most of the heated air to go up the stovepipe without first circulating around the oven. Partially closing the check damper allows cold room air to enter and reduce the temperature of the air as it flows up the stovepipe; the reduction in temperature reduces the rate of flow of gases up the chimney.

box lining. The 6- or 6½-inch wide burners are installed in the usual firebox; 8-inch burners may be used in the large firebox. The extra length which is oftentimes added to the rear of the firebox for burning wood is closed off with sheet metal when oil burners are installed. A metal shield is inserted inside the firebox between the burners and the ashpit damper so as to direct the incoming cold air *under* the burners. See Fig. 2. Directions are usually given to keep the ashpit damper about one-half closed.

Cold air striking one side of the burner sleeves will cause uneven flames, low at the side of cooling. The same thing occurs if the sleeves touch the firebox lining or if they touch the pipes in a water-front or coil.³ If the burner bowls are not set perfectly level, the flames will be uneven. Not only should each bowl be free of slant in any direction, but both of them should be on the same plane so that equal flames can be had with both valves on the same setting.

The copper tubing which constitutes the feed pipe should slant downwards from the reservoir to the valves and then upwards from the valves to the burner bowls. This tubing should be free from humps, depressions, or loops. Air can collect at the top of such curves and stop or restrict the flow of kerosene. It is claimed that a deep pitch, more than 3 inches, of the feed pipe from the valves to the burners and to the reservoir aids in pushing out the entrapped air. Valves should not be so close to the stove that they will get hot.

The proper positioning of the burners in the firebox is done according to one of the following guides: (1) The top of the burner sleeves should be from 1½ to 3 inches lower than the top of the oven. (2) The center height of the burners should be on the same plane as the center height of the oven. (3) The top of the sleeves should never be higher than the top of the oven. This will happen if the stove does not have sufficient depth in the firebox and ashpit to allow room for proper placing of the burners. The total depth of the firebox and ashpit should be not less than 18 inches if these burners are to be properly installed.

³ It is claimed that more efficient heating of a pressure tank of water is had by means of a five-turn coil around one of the burners than by means of the usual water-front used in the lining of wood or coal fireboxes.

EFFECT OF DRAFT CONDITIONS

Anything which cools the kerosene burners results in lower flames and less heat. This cooling is caused by too much draft through the stove and up the chimney, too much cold air entering the firebox, or any condition which gives insufficient resistance to the flow of hot air through the stove.

According to measurements made in the laboratory, opening or closing the dampers affected the stove temperatures as follows:

	Oven cooled	Top-stove lids cooled
Pipe damper opened	25° to 90° F.	50° to 130° F.
Ashpit damper opened	25° to 50°	40° to 80°
Oven damper opened ⁴	100° to 150°	65° to 80°

Note that opening the oven damper resulted in lower top-stove as well as lower oven temperatures. Therefore, the oven damper should always be kept closed after the burners are lighted and burning normally. Opening the other dampers, however, affected the top-stove lids considerably more than the oven temperatures. In fact, it was found that any change in height of flames or of damper regulation, other than oven damper, affected top-stove temperatures more than the oven.

The effect of opening the pipe damper would be most noticeable when the chimney draft is quite high and when there is a strong wind. The design of the stove also has an effect on the sensitivity of stove temperatures to draft. The stove shown in Fig. 2 was so designed that the hot air had a long passage to flow through before it entered the chimney. This stove was less sensitive to small changes in draft than was true of the stove shown in Fig. 3.

The stove illustrated in Fig. 3 provided a short, or direct, passage for travel of heated air around the oven before it entered the chimney. Highest temperatures in this stove were obtained when the draft was less than 0.02 inch. Somewhat higher temperatures existed in the other stove, Fig. 2, during a draft of 0.02

⁴ These figures are for the stove shown in Fig. 2. The oven damper of the cheaply constructed stove shown in Fig. 3 would not close tightly; opening it had but small effect on oven temperatures.

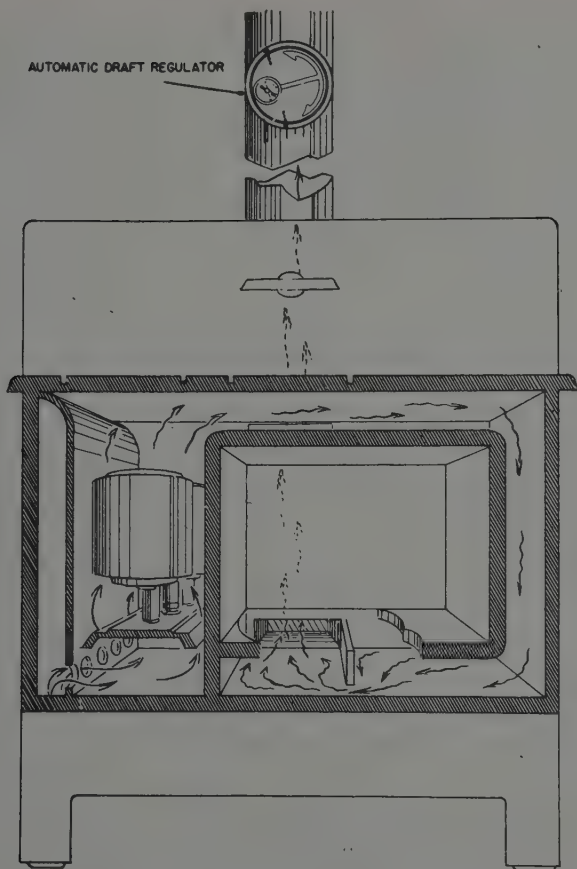


FIG. 3. Drawing of steel range to show the flow of air above and below the oven. Note the direct flow of air around this oven as compared with that around the cast-iron oven. The baffle suspended under the floor of the oven directed the air towards the front before it could escape up the stovepipe. Room air entered the firebox through the holes under the burners. There was no damper provided to regulate the intake of cold air at the firebox. The oven damper could not be closed tightly. An open-center pipe damper was provided but is not shown here.

An inexpensive, automatic draft regulator was purchased and installed for later tests. The draft regulator acts on the same principle as the check damper, which is discussed in the legend for Fig. 2. The regulator automatically tilts inward so that more cold room air can enter the stovepipe and reduce the draft through the stove; and during periods of low draft, the regulator closes the opening in the stovepipe. The regulator is shown closed in the drawing.

inch than of 0.04 inch but the difference was much less than for the direct-draft stove.

Opening the ashpit damper allowed more room air to enter the firebox and cool the burners. Ordinarily the ashpit damper is kept one-half closed. The same effect was observed whenever a draft from an opened window could blow into the firebox.

Warning: Closing of ashpit and pipe dampers too much is a hazard. Carbon monoxide is one of the gases formed when there is not sufficient air provided for complete combustion of the fuel. Streamers of soot will escape at any possible opening, and will quickly soil walls and household furnishings. Remember to look at the flames at intervals during the first $\frac{1}{2}$ to $\frac{3}{4}$ of an hour after any change has been made in height of flames or in closing of dampers; when the flames become sooty, open the ashpit and pipe dampers a little more. If these dampers have been properly adjusted while but one burner is in operation, it will be necessary to open them somewhat when both burners are operated on full flames. Also, the operation of the second burner causes the flame of the other to climb, and the climbing will continue until the firebox lining, burners, etc. are heated to a steady temperature.

EFFECT OF SAND UNDER THE OVEN

The presence of sand in the flue passage under the oven increases top-stove and oven temperatures in the same way that a very low draft does. Whether or not stove temperatures can be greatly increased by this procedure apparently depends on the design of the stove. The stove shown in Fig. 3 had no dampers to control the air intake at the ashpit and had but very little resistance to the flow of air around the oven. The passage for the flow of air was short and the flue passages above and below the oven were unusually high. Engineers know that a shallower flue passage is needed when kerosene is burned than when wood or coal is used.

Enough sand was added to the flue passage under the oven shown in Fig. 3 to restrict the free space for flowing air to $1\frac{3}{4}$ inches. This caused the oven temperatures to increase 75° and top-stove over 100° F. But the addition of sand under the oven shown in Fig. 2 had no appreciable effect on stove temperatures. The flue passage was 2 inches high; sand was added to leave a free

space of about $1\frac{1}{2}$ inches. Note in Fig. 2 that this stove was provided with an ashpit damper which was kept $\frac{1}{2}$ closed and that the passage for flow of air was much longer than in the other stove.

Top-stove temperatures of the range shown in Fig. 3 were lower than those of the other stove. The flue passage above the oven was also higher, $3\frac{1}{4}$ inches instead of $2\frac{1}{2}$ inches. Perhaps the top-stove temperatures could have been increased by adding a one-inch layer of non-combustible material on the top of the oven. This would have left a free space of a little over 2 inches for the flow of air, and would have pushed the air closer to the stove lids.

EFFECT OF POSITION OF BURNERS

Burners placed high in the firebox give relatively high top-stove temperatures but relatively low oven temperatures, and burners placed low in the firebox give the reverse. For example, oven temperatures were cooled 30° to 40° F. and top-stove temperatures increased about 30° to 40° by setting the burners $\frac{1}{2}$ inch instead of $2\frac{3}{4}$ inches lower than the top of the oven. Lowering the burners $1\frac{1}{2}$ inches in another stove gave somewhat higher oven and equally lower top-stove temperatures. Note that these temperatures are not as great as can be caused by failure to regulate the dampers. (See page 278.)

OVEN PERFORMANCE

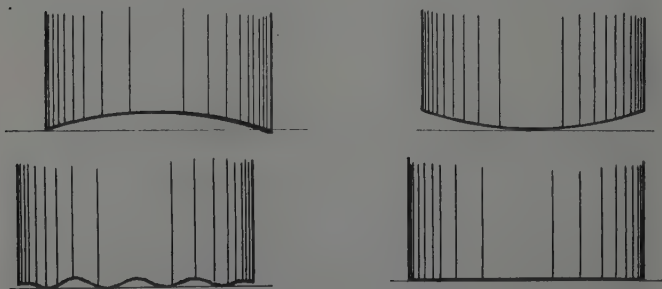
To heat the oven to moderate baking temperatures required from $\frac{3}{4}$ to nearly $1\frac{1}{2}$ hours, depending on the height of the flames used and upon draft conditions. This heating was begun with the lighting of both burners. The use of but one burner did not heat the oven to temperatures above 300° . When preheating was begun with the lighting of the second burner after the stove was already heated with one burner, the oven could be heated to 350° and 400° F. in about 20 minutes less time. But for oven temperatures higher than 400° , almost as much time was required as when the heating was begun with the stove at room temperature.

These baking temperatures were measured near the bottom of the oven. The temperatures at the center rack were about 30° hotter than at the bottom, and those near the top wall were about

40° hotter than at the center. Therefore, when the bottom of the oven was at 350°, the temperature at the center rack was about 380° and that near the top wall was about 420° F. However, emphasis is placed on bottom-of-oven rather than on center-rack temperatures because in the laboratory more uniform browning of bread and cakes was had with the tinned or the aluminum pans resting on the floor of the oven.

Batter and doughs tended to burn on top but failed to brown enough on the bottom when baked on the rack at the center. When the pans were put on the floor of the oven, these foods browned nicely on the bottom and were not overbrowned on top. Foods placed near the firebox side burned on top, but the burning covered a much larger area when the pans were on the center rack than when on the bottom of the oven.

When the baking is to be done on the floor of the oven, flat-bottom metal pans are suggested. Pans which curve upward or downward touch the oven in only a few spots and thus cause uneven bottom browning. See Fig. 4.



Courtesy of Maine Agricultural Extension Service

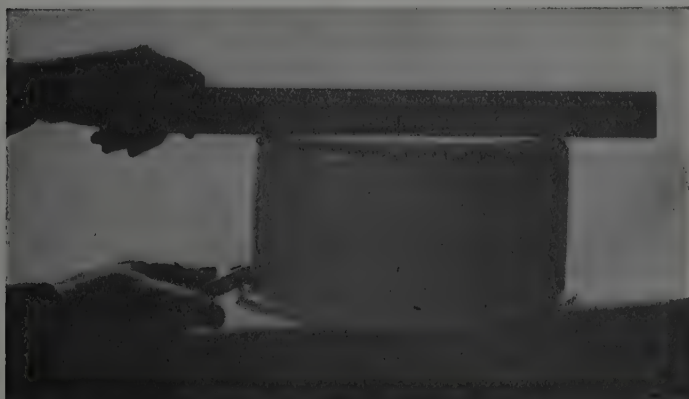
FIG. 4.—The concave-bottomed pan touches the stove lids only at the outer edge. The convex-bottomed pan touches only at the center. The dent-bottomed pan touches the stove in more spots than the first two, but does not have as much area in contact with the hot stove as does the flat-bottomed pan.

TOP-STOVE PERFORMANCE

The heat provided from these oil burners for top-stove cooking is slower than can be had from electric, gas, and some kerosene ranges.⁵

No time is saved during heating of foods to boiling by removing the stove lid and exposing the pan to the flames from the burner. On the contrary, more time was required to heat water to boiling when the pan was exposed to the flames. When water heating was begun with the lighting of the burners, only a slight difference in time was observed. But when the water heating was begun with the stove already hot, 50% more time was required to obtain boiling when the stove lid was removed. During one-half hour of boiling in the covered pan, 1½ cupfuls of water was lost when the pan was exposed to the fire, whereas 2 cupfuls of water was "boiled away" when the pan rested on the stove lid.

When the top of the stove is only moderately hot, the slow rate of heating can be overcome to some extent by boiling foods in cov-



Courtesy of Maine Agricultural Extension Service

FIG. 5. An easy means of determining whether a pan is flat on the bottom.

⁵ Presumably heat from the gasoline burner and from the stoves heated by wood or coal is as much as that obtained from the stoves mentioned, but this laboratory has no figures in regard to actual rates of heat utilization from them.

ered rather than in uncovered pans and by using flat-bottom pans. See Figs. 4 and 5. A cover on the pan will noticeably decrease the time to heat foods to boiling. Oftentimes a cover is necessary to keep the water at boiling instead of at simmering temperature. Likewise, the time of heating to boiling will be less and the vigor of maintained boiling will be greater if the pan has a large area of contact with the stove than if the pan has but little contact with the hot stove lids.

KEROSENE CONSUMPTION

One 6½-inch burner on moderately high blue flame used approximately 1 pint of kerosene per hour. Since a very high flame from only one burner will not maintain the oven at temperatures above 300° F., the use of both burners will be necessary for most baking.⁶ To maintain the air at the bottom of the empty oven at 350°, about ⅞ quart of kerosene per hour was used; to maintain 450°, about 1⅞ quarts per hour was consumed. Obviously, more heat and fuel are required to maintain these temperatures when there is food in the oven.

Homemakers report using from 2½ to 4 gallons of kerosene per day, or 50 gallons every two weeks during the winter. They operate one burner continuously on a moderately low flame to heat the kitchen or the hot-water tank and use both burners only as needed during meal preparation.

CAUSE AND EFFECT OF AIR IN THE FEED PIPE

Air can enter the feed pipe whenever the kerosene in the reservoir falls below the level of the opening into the feed pipe. This can happen when an empty tank is not refilled until after the flames begin to diminish. Air pockets may also form when the burners are put in use after the feed pipe has been emptied of kerosene during the cleaning of the valves. These air bubbles restrict

⁶ Stoves specially designed for the burning of kerosene may utilize heat more efficiently so that low baking temperatures can be maintained with one burner only. However, the fact that a stove may appear to be specially built for these burners is not an indication that the design is suitable. The stove shown in Fig. 3 was purchased as kerosene burning with no provision for use of wood or coal, but the design was not suitable for efficient use of kerosene.

the flow of kerosene. Thus, when the burners are to be lighted, the kerosene flows so slowly that an unusually long time is required to saturate the asbestos rings, and even after the burners are in operation, the flames are low although a high valve setting is used.

It was found in the laboratory that the air could be churned out by quickly turning the valve or valves completely off and on several times. This was repeated at intervals for three or four times. When this was ineffective, the flames were turned out, the sleeves and lighting rings removed, then the valves opened wide and a syringe inserted part way in the carbon leg to suck out kerosene until it would flow normally. Suction at the air vent was also effective in drawing the kerosene through the feed pipe forcefully enough to drive out the air.

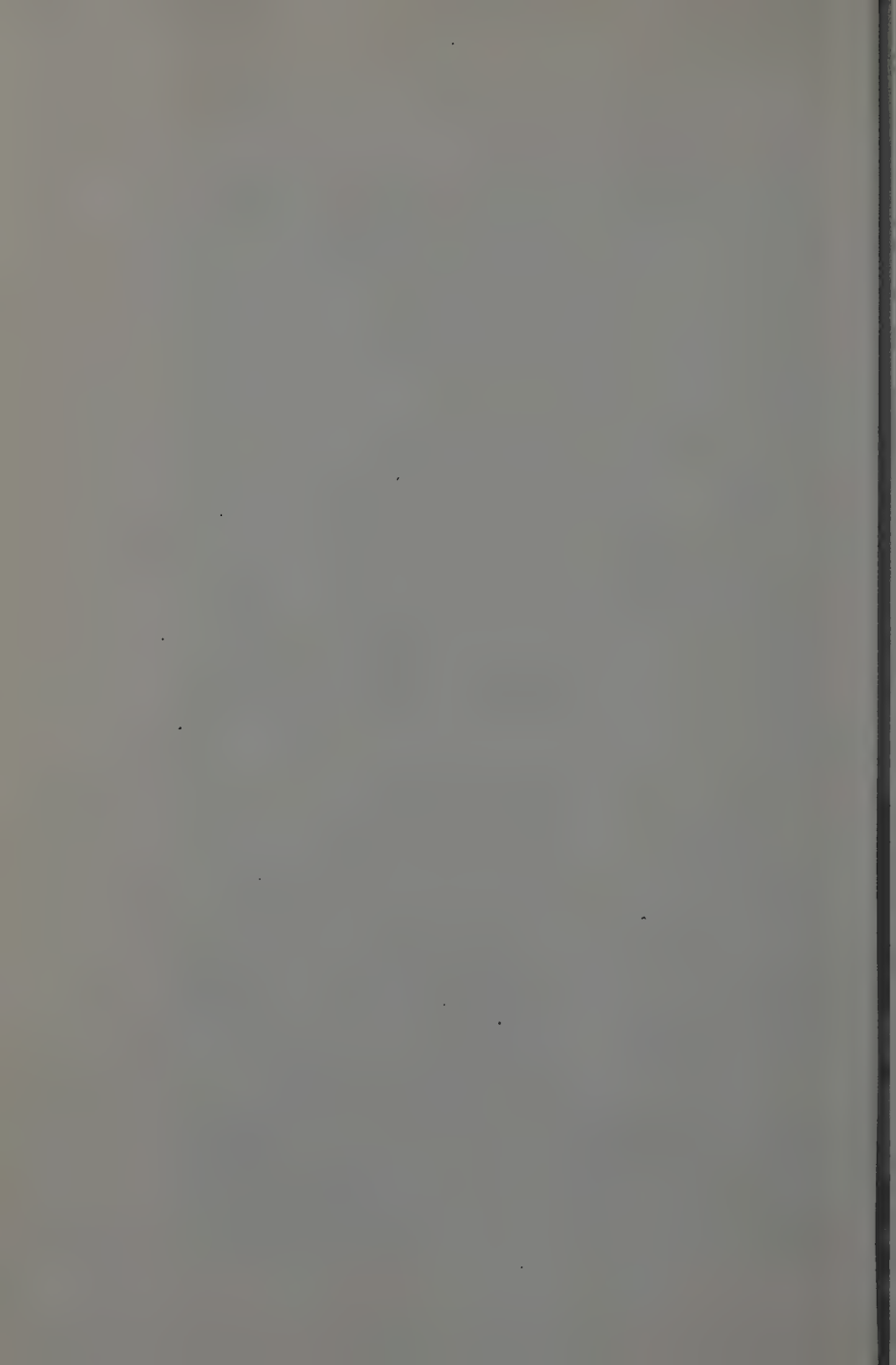
One or both of the flames may diminish after a refilled tank is put in place. This happens in spite of the fact that there is sufficient kerosene in the reservoir to cover the opening to the feed pipe when the tank is put in place. Some of the homemakers reported this trouble. In the laboratory, more difficulty was had with the cheaper installation than with the one of better quality. Usually the flames could be brought back to normal height by the churning process just described.

CLEANING THE BURNERS

The burners were not used long enough in the laboratory for the carbon legs to become stopped up with the hardened, unburned oil. The carbon leg is the pipe which leads from the burner bowl to the copper tubing. These carbon legs generally require cleaning once or twice a year when kerosene is burned. The symptoms of stoppage would be similar to that described above for entrapped air in the feed pipe; that is, the kerosene flows so slowly that a very long time is required for the asbestos rings to become saturated and the flames burn unusually low.

Carbon also collects on the asbestos lighting rings. If the rings are slow in soaking up the kerosene when its flow appears to be normal, the rings should be freed of this carbon or new lighting rings should be installed.

If the burner sleeves are made of material which is not rust resistant, scales will collect in the grooves of the burner bowls. Clean these grooves.



TREATMENT OF POTATO REFUSE PILES TO PREVENT SPREAD OF LATE BLIGHT

G. P. STEINBAUER

Late blight or "rust" is the cause of serious losses in yield of potatoes in Maine. It has been estimated by Bonde and Schultz (1)* that over \$1,000,000 a year is spent on copper fungicides used in the spraying program. They further state, "In spite of this extensive spraying program, the annual loss caused by late blight in Maine is nearly 4,000,000 bushels or about nine per cent of the total crop of the State."

Although some progress has been made in the production of blight resistant varieties, the principal means used at present in reducing losses from this disease are: (1) preventing spread of the blight organism from diseased tubers and vines in potato refuse piles, (2) carrying out an effective spray program, and (3) making use of those harvesting and storage methods which are designed to reduce chances of tuber infection.

The importance of the potato refuse or cull pile as a source of infection early in the season has already been pointed out by Bonde and Schultz (1). Since diseased cull potatoes are discarded in refuse piles on most of the 6,000 farms in Aroostook County as well as on the premises of potato dealers and on community waste heaps, it is clear that sources of blight infection are widespread.

COMMUNITY ACTION NEEDED IN DESTROYING POTATO REFUSE PILES

Unfortunately, far too many growers feel that a small refuse pile is of little or no importance as a source of blight infection. They do not realize the capacity of the blight organism to produce enormous numbers of wind-borne spores. Actually millions of these spores can be produced on a few vines under favorable conditions. A few careless individuals who do not properly treat these infected dump heaps may undo much of the work of the careful growers.

* Reference is made by number to "Literature Cited" on p. 292.

The Extension Service (2) is conducting a campaign to eliminate the potato cull pile as a blight menace. However, the responsibility for the actual treatment of these discarded potatoes rests with the growers, dealers, and warehouse owners, especially on their respective properties. In many communities there are common waste heaps and the question arises as to who shall undertake control of such material. It would seem that communities that derive their income from potato growing could well afford to appoint someone to be charged with this responsibility. Costs of eliminating these infected vines are small when the growers and dealers cooperate.

HOW EARLY SHOULD REFUSE HEAPS BE TREATED

According to Bonde and Schultz (1) the earliest record of blight infection on refuse heaps in Northeastern Maine during any year was on June 8. Potato dumps should be treated preferably by June 1, certainly not later than June 15, and then at bi-weekly intervals as long as green sprouts remain. Many of the methods recommended in this bulletin will completely kill the sprouts and tubers with a single treatment. However, many of the refuse heaps are added to during late spring and early summer, as the potato warehouses and cellars are being emptied and cleaned for storage of the new crop, so that the treatment may need to be repeated.

METHODS OF TREATING POTATO REFUSE HEAPS VARY

There is no one method of treating refuse heaps that is superior to all others. The important thing to remember is that the dump piles should be treated *early* enough, *treated effectively*, and checked for *recurrence of sprouts*. Tubers that have been discarded during the winter period need give no further concern, provided they have been scattered in thin layers outdoors during freezing weather.

As far as the small dump heaps on farms are concerned, the old saying, "Out of sight, out of mind," applies all too well. In many instances the discarded tubers are carted off to some thicket and forgotten. Bonde and Schultz (1) point out that "experience has shown that the average grower frequently fails to destroy the

TABLE 1

Herbicides useful in treating potato refuse heaps to prevent spread of late blight.

Herbicide	Preparation and concentration	Remarks and precautions
Sinox	2 gallons of concentrate, to 90 gals. of water, then add 10 lbs. of sulfate of ammonia (previously dissolved in several gals. of water), make up to total of 100 gals. of spray solution.	Relatively non-poisonous to humans but vapors should not be breathed, or liquid taken internally. Stains woolens and other animal material.
Dowspray "66"	12 lbs. to 90 gals. of water, then add 1 lb. of sulfate of ammonia (previously dissolved in several gals. of water), make up to total of 100 gals.	Fumes are very irritating to nose and skin.
Sodium arsenite	12 lbs. to 100 gals. of water, or about 24 lbs. of "Handy Killer" to 100 gals. of water.	Arsenites are violent poisons, do not breathe vapors. Use only where there is no danger of livestock poisoning.
Ammonium sulfamate	1 lb. to 1 gal. of water.	Quite corrosive to most metals other than brass or aluminum.
Ammonium thiocyanate	1 lb. to 1 gal. of water.	
Chlorates	1 lb. of sodium chlorate or 1½ lb. of Atlacide to 1 gallon of water.	Chlorates present a fire hazard unless carefully used. Write for detailed information and precautions before using these materials.
Spent crank case oil, creosote oil, diesel oil, Meo-181.	Use full strength, diluting heavier materials with kerosene to get a consistency suitable for spraying.	Effective if sprouts are young but not as reliable as other treatments.
Copper sulfate (blue vitriol or bluestone)	50 lbs. to 100 gals. of water.	

tops before infection has spread to adjoining potato fields. In view of the difficulty of destroying potato tops on dump piles, it would be much better not to deposit waste potatoes at all." Steimbauer (3) has shown that out of a variety of inexpensive chemical dips available, the most effective one for killing tubers before discarding them is a saturated solution of sodium chloride or common salt. Potato refuse, even when including whole tubers, immersed in a vat of salt brine for 12 hours yielded no sprouts when planted. The refuse can be skimmed off and the brine used repeatedly. Small lots of cull tubers may also be satisfactorily disposed of by *deep burial*, or by piling such refuse in thin layers on top of combustible material and *burning* the material so as to cook the refuse.

If the cull potatoes have not been treated by any of the three methods just described, it will be necessary to treat the potatoes after they have sprouted, using herbicides. So far as is known, herbicides will be wasted if used before the tubers have sprouted. The practice of cutting the tops of sprouted plants in refuse heaps should not be planned on, since the uncut basal parts of the shoots may contain blighted material and the tubers will usually sprout again.

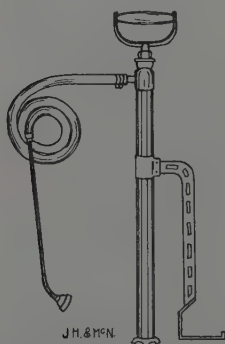


FIG. 1. Bucket pump, operated by placing cylinder in pail, holding it in place by foot piece on outside of pail, and operating plunger by hand.

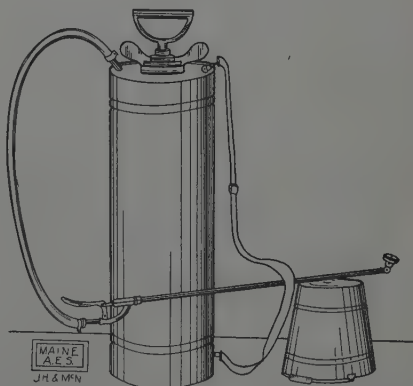


FIG. 2. Cylinder type, compressed air sprayer, hand operated and well suited to spraying small potato refuse piles.



FIG. 3. Boom to be operated from a power sprayer, useful in treating large potato cull piles. In use one man operates the boom, controlling the spray by means of the cut-off valve. The boom is connected to the power sprayer by fifty or more feet of orchard sprayer hose. This boom has other uses on the farm such as applying herbicides along fences and headlands, and eradicating aphid host plants such as wild plum and buckthorn.

After tubers in refuse heaps have sprouted, several different herbicides can be used to kill the sprouts, and these herbicides usually kill the eyes also so that no further sprouting occurs. However, when the refuse is in large heaps, more than one application may be needed to kill the buried sprouts and tubers. The herbicides listed in Table 1, sprayed or sprinkled on the potato refuse, have been found effective in killing the sprouts and tubers.

Herbicides may be applied on small cull piles with a sprinkling can, or with sprayers such as the bucket pump and cylinder type compressed air sprayers illustrated in Figs. 1 and 2. Large refuse heaps along railroad sidings and potato warehouses are best treated with a power sprayer and the spray boom illustrated in Fig. 3. The nozzles on the boom are those used on the ordinary farm potato sprayers, and the pipe is $\frac{1}{2}$ inch stock. The boom is connected to the power sprayer by orchard spray hose, 50 feet or more in length. With this equipment, potato growers in the vicinity of Presque Isle, Maine, have been able to effectively treat hundreds of barrels of potato refuse in a short time. The Dowspray "66" and Sinox sprays are very useful for this purpose. Foliage and tubers should be thoroughly covered and drenched with herbicides to insure rapid killing action. Spray equipment should be thoroughly rinsed out after using any of the above herbicides.

For sources of chemicals consult your county agent.

IMMEDIATE EFFECTS OF POTATO REFUSE TREATMENT NOT ALWAYS EVIDENT

Because of the capacity of the blight organism to produce enormous numbers of spores, which may be carried long distances by the wind, it should not be expected that treatment of the ma-

jority of refuse heaps will completely eliminate late blight. Under favorable weather conditions blight epidemics may develop from a few isolated infected plants. However, a determined community effort to wipe out the potato dump menace should delay the appearance of blight and materially cut down the losses from this disease. For effective blight control, this program must be combined with an effective spray program and the use of approved practices in harvesting and storing potatoes.

LITERATURE CITED

- (1) Bonde, Reiner, and E. S. Schultz
Potato Refuse Piles as a Factor in the Dissemination of Late Blight. Maine Agr. Exp. Sta. Bul. 416, 1943.
- (2) Annual Report, Maine Extension Service, 1943-44.
Maine Ext. Bul. 325, 1944. See p. 26-27.
- (3) Steinbauer, G. P.
Treating Potato Refuse Piles in Control of Late Blight. Me. Agr. Exp. Sta. Bul. 426, 1944. See pp. 234-235.

BULLETIN 435

MAINE FARM PRICES DURING WORLD WAR PERIODS

CHARLES H. MERCHANT¹

INTRODUCTION

Prices serve as a guide to farmers in their production and marketing programs both in war and in peace. Prices received and prices paid farmers are relative. Farm prices are neither high nor low except in comparison with other prices or prices of the same product at different times. Relatively high farm prices tend to encourage and relatively low prices tend to discourage agricultural production.

World war periods bring about unusual conditions which result in widespread shortages and higher prices. Postwar periods on the other hand have caused declining prices and so-called "agricultural surpluses." During World War I the United States experienced a period of inflation during and immediately following the war. This period of inflation was followed by one of deflation beginning in the latter part of 1919. At the outbreak of World War II, wholesale prices in this country advanced at about the same rate as in World War I. However, the advance has been checked at least temporarily by government regulations, especially those on rationing and price ceilings. The farm price situation following World War II will depend partly on what happens to the general price level during the latter part of the war and a few years thereafter.

The purpose of this publication is to point out the similarities and differences which have taken place in Maine farm prices during the two world war periods. On the basis of past experience certain economic conditions and price relationships may be expected in the coming postwar period. These will be discussed in this report.

¹ The author is indebted to Jeanne E. McKenney and Elaine M. Pooler for the collection and tabulation of the statistical material, and to Lee Davis for making the graphs.

THE AGRICULTURAL SITUATION DURING WORLD WAR PERIODS

Farm prices in Maine are influenced, by economic conditions throughout the United States and to a somewhat lesser degree by those in foreign countries. Also, agricultural prices in Maine, as in other states of the Union, bear a definite relationship to the relative prosperity of other kinds of business. Full employment in industry creates strong demands for agricultural products even at relatively high prices. This relationship of agriculture to other businesses and that of Maine agriculture to the agriculture of the nation exists both in peace and in war. Our economic system has become very complicated and all its parts are interrelated. This situation promises to become even more complicated after World War II.

Due to the many factors prices are constantly changing. Prices of some commodities fluctuate more violently than others due to greater changes in the price determining factors. World wars bring about abnormal conditions which result in abnormal prices. During World War I and for the first two years of World War II, wholesale prices of all commodities advanced rapidly. This country experienced inflation during the latter part and immediately following World War I. Our Government is attempting to prevent inflation during and after World War II. When prices continue to advance over a period of years as in a major war, there is a tendency toward overconfidence associated with much buying by the public. Following World War I and in the depression of the thirties, the public developed a lack of confidence and prices declined abruptly.

The outstanding periods of rapidly rising and declining prices in our history have occurred during and after major wars (Figure 1). In the War of 1812 wholesale prices of all commodities in this country increased nearly 40 per cent in two years and a drastic decline in prices followed. During the Civil War wholesale prices more than doubled between 1862 and 1865, followed by an abrupt price decline. Then, in World War I the wholesale price index reached the unprecedented high of 226 for 1920, when 1910 to 1914 equals 100, followed by a precipitous decline. Now we are engaged in World War II, the largest war in history, and wholesale prices in January 1945 reached an index of 153. This Government

and other governments have taken drastic steps to prevent prices from rising to extreme heights as in other major wars. The degree of success of the various governments will depend largely on the measures taken and the cooperation of their people. Also, when the war is over, there will be a great clamor for easing and removing wartime restrictions on price ceilings and rationing. If these restrictions are released too soon, a violent period of inflation is likely to develop. Farm prices in the United States after World War II will depend largely on the success attained by the Government in stabilizing wholesale prices of all commodities and maintaining good employment at reasonable wages.

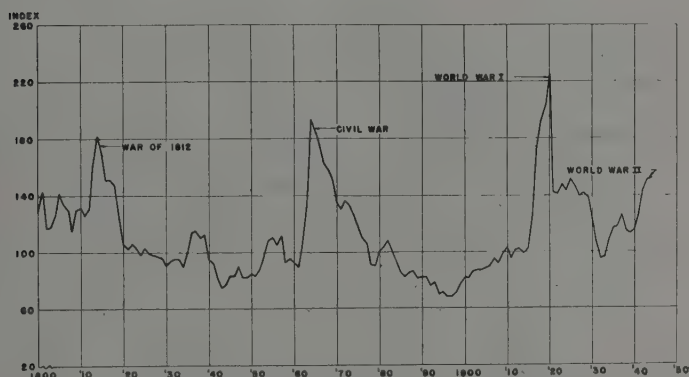


FIG. 1. INDEX OF WHOLESALE PRICES OF ALL COMMODITIES IN THE UNITED STATES SINCE 1800. Prices advanced rapidly during each major war followed by a precipitous decline in prices shortly after the war.

WHOLESALE AND FARM PRICES

There is a fairly definite relationship between various prices and price movements. When the general level of prices advanced rapidly, wholesale prices of raw materials advance first, followed by wholesale prices of manufactured goods, and later by retail prices and then wages. The same relationship exists when the general price level declines abruptly. Hence, wholesale and farm prices decline first followed by declines in retail prices and wages. As the products produced by farmers include many raw materials,

farm prices are among the first to move when the general level of prices advances or declines rapidly. This relationship of farm prices to other prices has occurred during all major price changes in our history.

Farm prices in the United States followed very closely the rapid advance in wholesale prices of all commodities during World War I (Figure 2). Following World War I (in November 1919)

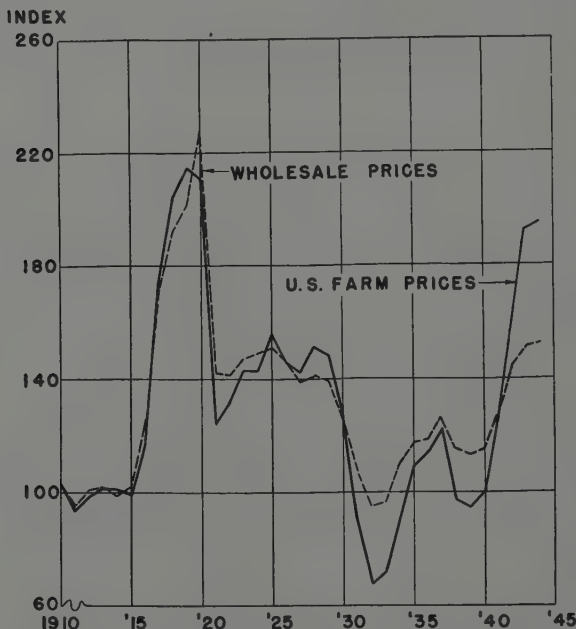


FIG. 2. COMPARISON OF FARM PRICES AND WHOLESALE PRICES OF ALL COMMODITIES IN THE UNITED STATES FROM 1910 TO 1944. Drastic fluctuations in farm prices during world war periods have coincided closely with those of wholesale prices of all commodities in the United States. During World War II farm prices have advanced to a much higher level than wholesale prices of all commodities due chiefly to Government regulations to control prices. If a downward adjustment in prices occurs, farm prices will decline more rapidly and probably to a lower level than wholesale prices of all commodities.

farm prices and wholesale prices of all commodities declined precipitously but farm prices dropped to a somewhat lower level than prices of all commodities. Likewise, during World War II farm prices and wholesale prices of all commodities advanced rapidly, with farm prices reaching a higher level in 1945 than wholesale prices of all commodities. If a downward adjustment in prices should occur after World War II, farm prices will decline more rapidly and probably to a lower level than wholesale prices of all commodities.

In general, Maine farm prices have coincided rather closely

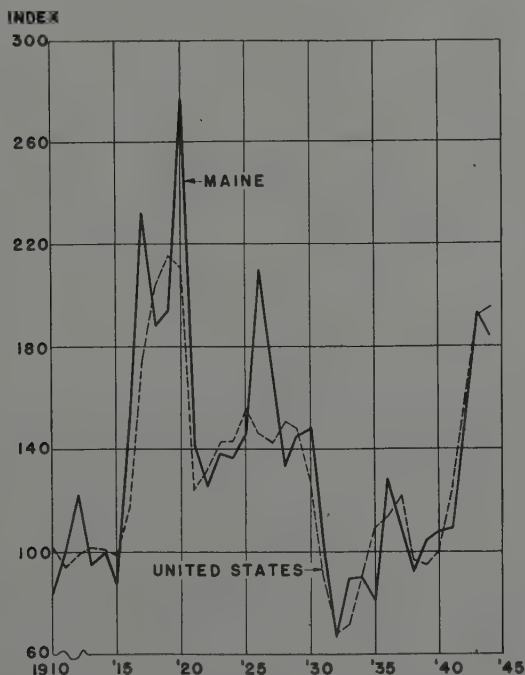


FIG. 3. COMPARISON OF MAINE AND UNITED STATES FARM PRICES 1910 TO 1944. Farm prices in Maine have coincided very closely with United States farm prices during the two world war periods. (The high farm prices in Maine during 1926 and 1927 were due to relatively high potato prices resulting from small potato crops throughout the country.)

with farm prices for the entire United States for the past 35 years (Figure 3). However, during World War I, Maine farm prices advanced to a much higher level than those for the nation due to the extremely high price of potatoes during the war period. Maine farm prices in the present world conflict have coincided almost exactly with those for the entire country. It is reasonable to expect that the relationship between Maine and United States farm prices will continue throughout the remainder of World War II and during the postwar period.

PRICES PAID BY FARMERS

Many factors are involved in the prosperity of farmers. Among these factors is the relationship between prices farmers receive for farm products and the prices they pay for the things they buy. This relationship is often referred to as the "parity ratio." This ratio is favorable to farmers during periods of rising prices and unfavorable when prices are declining. Hence, during world war periods this ratio has been unusually favorable to farmers. However, following World War I and the depression years of the thirties, the ratio was very unfavorable. If the level of prices should decline after World War II, the parity ratio will again become unfavorable to farmers.

Maine farmers, like the average of all farmers for the entire United States, have experienced periods of favorable and unfavorable parity ratios. During each world war period the ratio has been very favorable to Maine producers (Figure 4). But, for much of the period between the two world wars the parity ratio has been unfavorable. As previously indicated, if prices decline after the present world conflict the parity ratio for Maine farmers will again be unfavorable. However, the price situation will not be equally unfavorable to all kinds of farming in the State or to every farmer within a locality. (See section of this report on farm prices by types of farming, pages 350 to 358.)

For about 20 years our Government has made many attempts to adjust prices farmers receive with prices of the things farmers buy. In these attempts many methods have been employed to adjust the two price levels to a common basis. There is considerable controversy over the degree of success that these various measures have

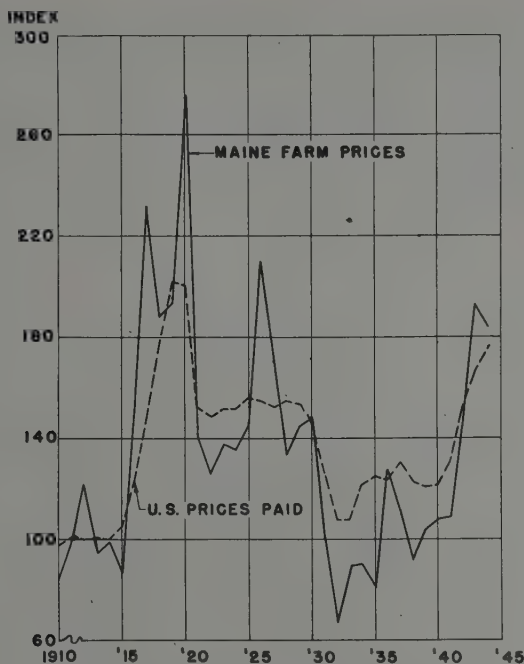


FIG. 4. MAINE FARM PRICES AND PRICES PAID BY FARMERS IN THE UNITED STATES 1910 TO 1944. During each world war period the relationship between the prices farmers receive and the prices they pay has been favorable to Maine farmers. However, for much of the period between the two world wars this relationship has been unfavorable.

attained. However, there seems to be little diversity of opinion that a stabilized wholesale price level would be desirable. If such a price level could be maintained, farm prices and prices farmers pay would adjust themselves and remain adjusted to a common level.

FARM WAGES

Farm wages lagged behind the rapid advance in wholesale prices at the beginning of World War I (Figure 5). From about

1917 to 1920 wages advanced somewhat more rapidly and to a slightly higher level than wholesale prices. When the precipitous decline in prices occurred in 1920, wages declined at about the same rate but not to as low a level as wholesale prices. For a few years after World War I, some recovery in wages occurred and wages were relatively high. As this country recovered from the depression of the thirties, wages were considerably lower than wholesale prices.

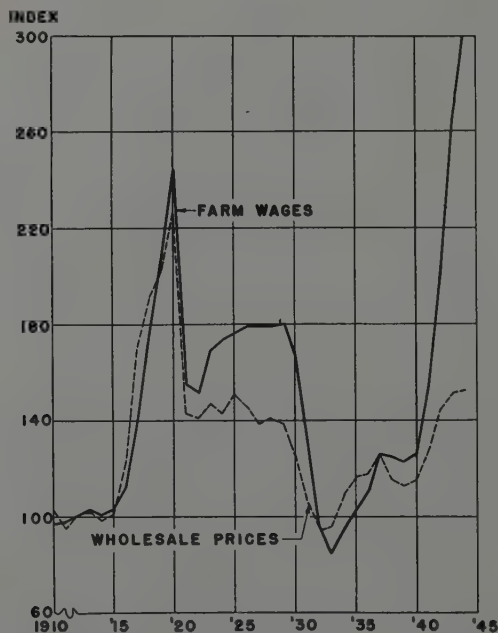


FIG. 5. INDEX OF FARM WAGES AND WHOLESALE PRICES OF ALL COMMODITIES IN THE UNITED STATES 1910 TO 1944. There is a tendency for wages to lag behind violent changes in wholesale prices. Wages have advanced to an all-time high during World War II. When prices decline again farm wages will decline more rapidly but probably will not reach as low a level as wholesale prices.

At the outbreak of World War II farm wages advanced at about the same rate as wholesale prices. However, wage rates maintained their rapid upward trend after 1942 when wholesale prices became relatively stable, fluctuating between an index of 145 to 155. When prices decline again farm wages are expected to decline more rapidly but not to as low a level as wholesale prices.

The productivity of farm labor has increased through the centuries. Today with modern machinery and improved farming methods farm labor produces more per person than at any other time in history. As the productivity of labor increases, it is reasonable to expect that labor should receive a corresponding increase in purchasing power. According to Warren and Pearson² the increase in productivity has been at the rate of about 1.7 per cent per year from 1840 to 1914. During this period the purchasing power of wages increased at about the same rate as the productivity. It is reasonable to expect that the trends in the productivity of labor and the purchasing power of wages have continued at an increasing rate since World War I.

The upward trend in productivity of farm labor may be expected to continue at an accelerated rate in the postwar period. The productivity of labor in the United States is much greater than of labor in many foreign countries. This in part accounts for the much higher wages paid farm labor in this country. Many misstatements have been made about our farmers competing with cheap labor of other countries. Using modern farm machinery, farm labor in this country may cost less per unit of product produced than farm labor in other countries with the so-called cheap labor. With the development of farm machinery it has been more difficult for farmers who could not use the machinery to compete in agricultural production. The more successful farmers make the most efficient use of the latest farm machinery on relatively large farm businesses. Also, one will find the best farm help receiving the highest wages on the larger farms.

Farm wages bear a definite relationship to wages paid city workers. When city wages are relatively high, more farm people are attracted to the cities. Fewer men are left in the country to compete for farm work and farm wages rise. Likewise, when

² Warren, G. F. and Pearson, F. A., *Farm Economics*, No. 74, February 1932, p. 1671.

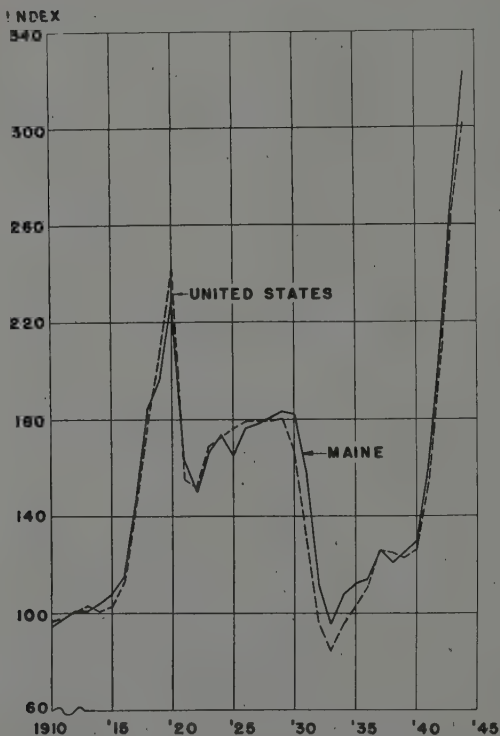


FIG. 6. FARM WAGES IN MAINE AND THE UNITED STATES 1910 TO 1944. Farm wages paid in Maine have coincided very closely with the average wage paid farm labor throughout the United States.

prices decline, unemployment occurs in cities, and many workers, especially those with farm background, seek employment on farms. During World War I and thus far in World War II many farm workers have either entered the armed forces or taken war jobs. Thus, a great scarcity of farm workers, including farm operators, has occurred in each war period. In 1920, after World War I, prices declined very rapidly. The unemployment which followed in cities caused many families to seek work in the country at much

lower wages. The situation after World War II will depend very largely on the general price level for the country and the employment conditions in peacetime industries. If prices decline rapidly with much unemployment in cities, many families will again seek work on farms.

Farmers located near cities usually find it necessary to pay higher wages for farm help than those living at a considerable dis-

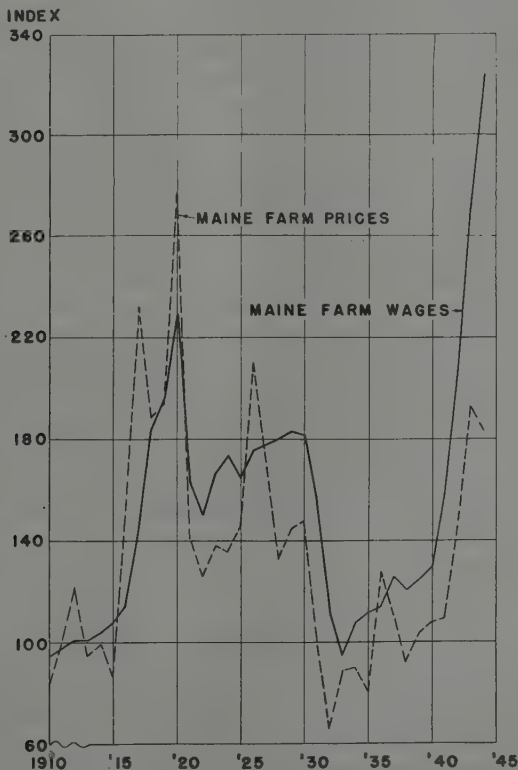


FIG. 7. FARM WAGES AND FARM PRICES IN MAINE FROM 1910 TO 1944. More violent fluctuations have occurred in Maine farm prices than in Maine farm wages. Following World War II Maine farm wages are not expected to decline to the level at which they were before the war.

tance from large centers of population. Farm laborers near cities demand wages comparable to those which they could receive by working in the cities. Such wages may have very little relationship to the profitability of farming in the area. In contrast, wages of farm workers in rather remote agricultural areas tend to correspond with the relative prosperity of farming in the areas.

Wages paid in Maine are higher than in states located at a greater distance from large consuming centers. This situation existed during and following World War I and may be expected to continue during and following World War II. Further, there is considerable variation in farm wages paid in Maine. These variations are due to distances to industrial centers and to the relative prosperity of the agriculture in the various areas.

Farm wages in Maine have coincided very closely with average farm wages for the entire United States (Figure 6). This relationship has existed in war and in peace. The relationship is expected to continue after World War II.

Maine farm prices fluctuate more violently than Maine farm wages (Figure 7). Maine farm wages lagged behind the advance in farm prices during World War I. In contrast, Maine wages and farm prices began to advance at the outbreak of World War II. However, wages have advanced to a much higher level than Maine farm prices. Following World War II wages will tend to adjust themselves downward unless a period of price inflation should develop. Then the downward adjustment will be delayed several years. When the decline in wages takes place, it is not expected to drop to the pre-World War II level, unless much unemployment develops in cities.

FARM REAL ESTATE VALUES

When farm incomes are high for several years, farm real estate values rise. Likewise, several years of low farm incomes bring about a decline in the selling price of farm property. Usually there is a lag of two or more years between a change in farm incomes and a corresponding change in farm property values. Also, when prices are relatively high, there is more interest in farm property and more farms change hands at higher prices. Conversely, when farm prices and farm incomes are relatively low, less interest is

manifested in farm property and comparatively few farms are sold. Following several years of rapidly rising prices, such as have occurred in major wars, considerable caution should be used in buying a farm.³

During and shortly after World War I, farm real estate values increased very rapidly throughout the United States (Figure 8). Land values increased over 40 per cent in Maine from 1916 to 1920 as compared with 57 per cent for the entire country. In some areas the advances in farm real estate values were so rapid as to be considered as "land booms." Farm real estate values began to decline in 1920. In Maine the decline was gradual until the beginning of the depression in 1930. However, real estate values for the entire country declined more rapidly than for Maine and reached the pre-war level in 1931. For many farming areas in the United States the decline in farm real estate values amounted to over 50 per cent during the 10-year period from 1920 to 1930. Such drastic declines in land values bring about hardships and disaster for many farmers who are heavily in debt and for young men who are ready to begin farming.

At the outbreak of World War II farm real estate values advanced. The increase in land values in Maine for the three-year period 1942 to 1944 amounted to 15 per cent. This increase may be compared with 25 per cent for the entire United States and as much as 30 per cent for some agricultural states. The farm real estate situation following World War II will depend to a considerable extent on the advance in real estate values during the remainder of the war and on farm prices following the war. If farm prices should be maintained near the present level after World War II, farm real estate values may be expected to show further increases. However, if farm prices decline, farm real estate values also will decline after one to three years at a somewhat lower rate. Farm real estate values in Maine are not expected to fluctuate as widely during or after World War II as the farm real estate values for the entire United States.

Farm real estate values in Aroostook County have shown wider fluctuations than the average for the entire State of Maine. This situation has prevailed during each world war period. Many

³ Merchant, Charles H., Choosing and Buying a Maine Farm, Maine Extension Bulletin 326, November 1944.

of the better agricultural areas of the country have shown the largest variations in farm real estate values during and following major changes in farm prices.

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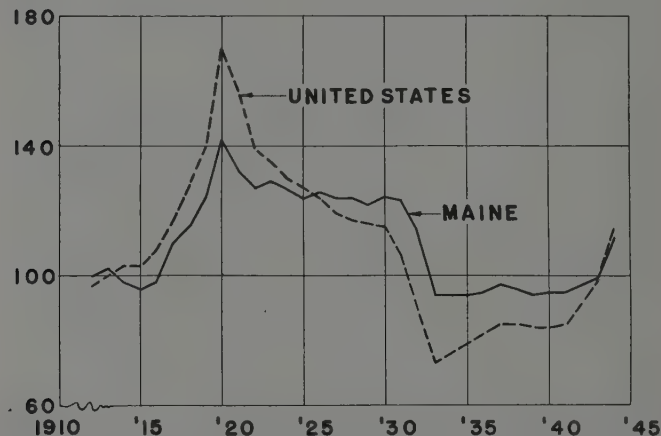


FIG. 8. FARM REAL ESTATE VALUES IN MAINE AND THE ENTIRE UNITED STATES 1910 TO 1944. Real estate values advanced very rapidly in Maine and the entire United States during each world war period. This advance in real estate values lagged behind the advance in prices. Following World War I real estate values declined but not as rapidly as farm prices.

FARM TAXES

Farmers pay many taxes. The more important are the general property tax, income tax, gasoline tax, and indirect taxes. For most farmers the general property tax is the largest tax burden. This tax, like most taxes, is paid in money regardless of prices received for farm products. When prices rise rapidly, as during world war periods, the general property tax lags behind price changes by several years. This relationship exists as wages and salaries of public officials, including school teachers, do not advance as rapidly as prices, and the number of persons employed increases relatively slowly during rising prices.

When the general price level declined abruptly, as following

World War I and in the depression of the thirties, general property taxes remained relatively high and in some states taxes actually increased. Again, this situation is due to the fact that taxes lag behind rapid changes in prices. Also, there is an increase in relief and the number of officials needed to administer relief programs during depressions.

In World War I general property taxes in Maine increased slightly, while a slight decline occurred during the first years of World War II (Figure 9). In other words, no material changes

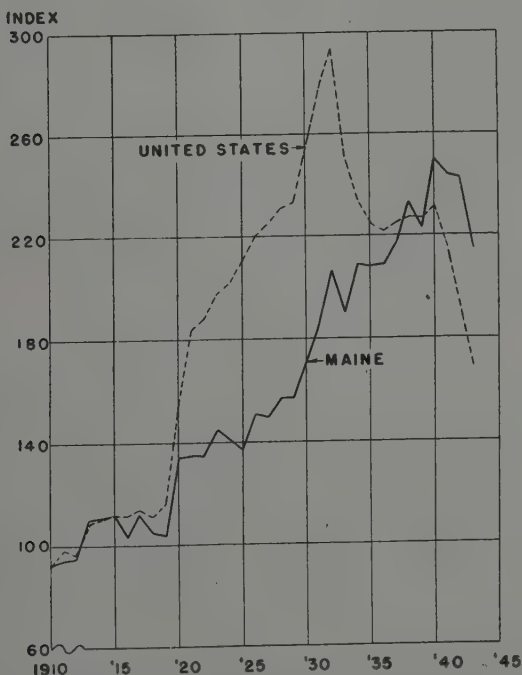


FIG. 9. FARM PROPERTY TAXES IN MAINE AND THE ENTIRE UNITED STATES FROM 1910 TO 1944. The farm property tax in Maine has consistently advanced from 1910 to the beginning of World War II. This upward trend in taxes in Maine is in contrast to the rapid advance in taxes followed by a rapid decline for the entire United States.

took place in the general property taxes in the State during the first years of the two world wars. However, taxes advanced very rapidly in 1920 and continued to advance until about 1940. During this 20-year period taxes have more than doubled. The rapid upward trend in farm property taxes in Maine has not coincided with the movement of property taxes in the entire United States. Property taxes for the entire country increased very rapidly following World War I and continued to move upward until 1932. From 1932 to 1944 property taxes have declined from an index of 294 in 1932 to 169 in 1943. Property taxes throughout the country may be expected to increase for several years extending well into the post-war period.

The general property tax, especially in Maine, is very burdensome under our present system of taxation. Eight to 20 per cent of farmers' incomes are required annually to pay the general property tax.⁴ Also, this tax is usually as high or higher during periods of depression when the farmer is least able to pay his taxes. It has been suggested that the tax base should be broadened to include other forms of taxation. Unless some changes are made in our present tax system, the general property tax will remain relatively high following World War II.

MARKETING AND DISTRIBUTION COSTS

Although many changes have been made in the marketing and distribution of farm products during the 25-year period between the two world wars, certain price relationships continue to exist. The cost of transportation lags behind a rapid change in prices. This is due to the fact that many costs that go to make up the charges for transportation do not fluctuate with a rapid change in prices. Wages, for example, which represent a large part of the cost of transportation, lag behind a rapid rise or decline in whole-sale prices.

Freight rates on fruits and vegetables in the United States advanced very little in World War I until about 1918 (Figure 10). Following World War I freight rates advanced from an index of

⁴ Merchant, Charles H. and Parsons, Merton S., *Farm Property Taxation in Maine*, Maine Agricultural Experiment Station, Bulletin 366, June 1933, pp. 240-241.

125 in 1918 to an index of 161 in 1920. After 1920, freight rates declined at a relatively slow rate, remaining about 45 per cent above prewar (1913) until the early thirties. During the depression in the thirties, freight rates declined very little when wholesale prices dropped nearly one-third from 1929 to 1932.

At the beginning of World War II freight rates in the United States on fruits and vegetables declined over 2 per cent from 1938 to 1941. Unfortunately the information on freight rates has not been made available since 1941. However, one would expect an increase in freight rates two or three years after an advance in

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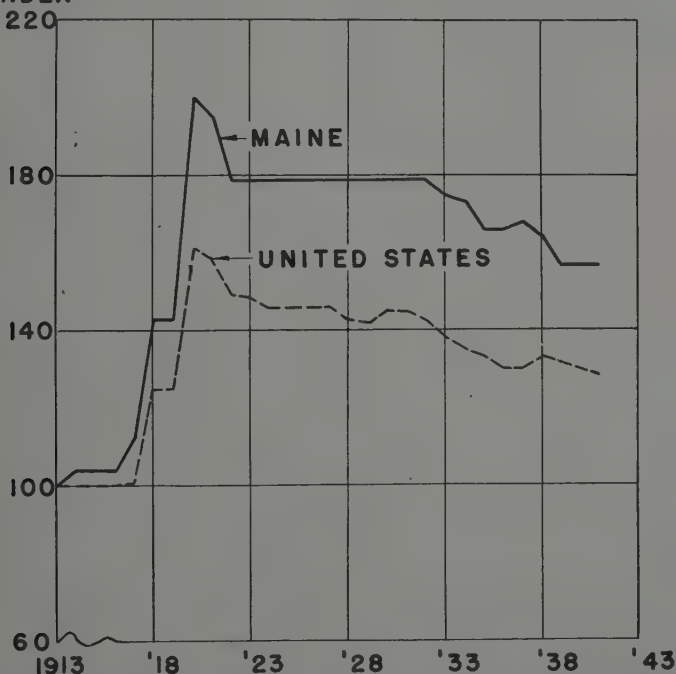


FIG. 10. FREIGHT RATES FOR FRUITS AND VEGETABLES IN THE UNITED STATES AND POTATOES IN MAINE, 1913 TO 1941. Freight rates lag behind major changes in wholesale prices of all commodities in the United States. Freight rates increased very little during the first years of World Wars I and II.

wholesale prices. Also, that such an increase would continue through the present world conflict and probably well into the post-war period.

Information is available on freight rates for Maine potatoes from 1913 to 1941 and shows much the same general situation as freight rates for fruits and vegetables for the entire United States. In 1918 freight rates for Maine potatoes had advanced 43 per cent above the 1913 level. Immediately after World War I freight rates rose rapidly but at a slower rate than the wholesale price level of all commodities in the United States. During 1920 and 1921 the freight rate for Maine potatoes was nearly double that of prewar. In the depression in 1932, freight rates declined to an index of 179 and remained at this level until 1933. From 1933, rates declined from an index of 175 to an index of 157 in 1939. No change in rates occurred from 1939 to 1941.

Storage facilities for Maine farm products were increased and improved during the period between the two world wars. Better storage facilities enable farmers and others to market better quality products over a much longer marketing season. The cost of storage facilities, like freight rates, lags behind major changes in wholesale prices. The reasons for the lag are much the same as for freight rates.

The costs involved in selling farm products from producers to consumers also lag behind a rapidly changing price level. These costs, especially in wholesale and retail trades, are often referred to as margins or mark-ups. While these margins have varied from time to time, the variations are rather infrequent and small in amount. This situation arises because certain costs in marketing remain fairly constant for considerable periods of time. Rent, lights, water, electricity, and certain other costs are slow to change. Thus, with advancing prices marketing costs lag behind. This results in a lag in the charge for marketing services. When prices decline rapidly the same situation exists. Many marketing costs are very slow to change. Hence, following a decline in the general price level, costs in selling farm products remain relatively high for several years.

Following World War II one of the most important problems in this country and throughout the world will be the efficient distribution of farm products. Much of the equipment and facilities is out-of-date and much time will elapse before modern facilities

can be made available. As an illustration, many terminals in our larger markets are inadequate and inefficient, but city officials have difficulty in agreeing on a plan for improvement. However, until efficient facilities are made available, both producers and consumers are going to pay a relatively high cost for the marketing of farm products.

The cost of distribution of food (summary of all costs of marketing and distribution of farm products) in the United States increased very rapidly following the first years of World War I (Figure 11). After the Armistice in 1918 the cost of distribution continued to increase rapidly to twice the prewar level in 1920. Following World War I the cost of distribution has remained relatively high. In 1933 when farm prices in the United States declined to slightly over two-thirds of the prewar level, the cost of distribu-

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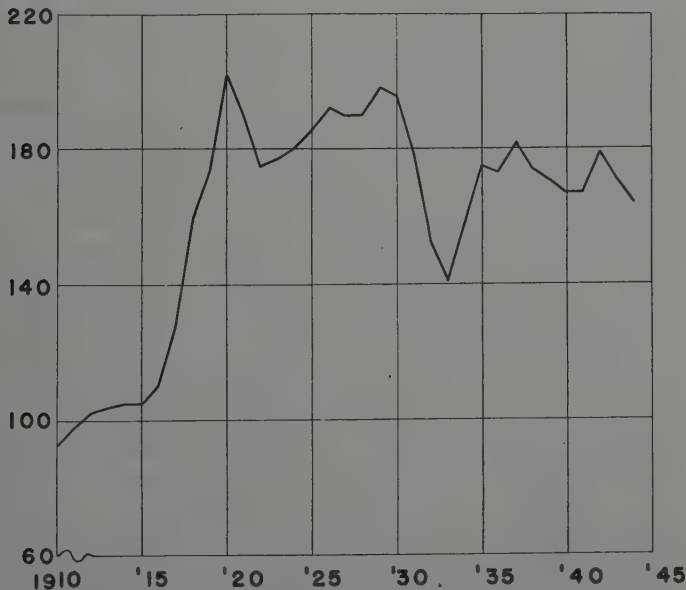


FIG. 11. COST OF DISTRIBUTION OF FOOD IN THE UNITED STATES, 1910 TO 1944. The cost of distribution of food lags behind major changes in prices. When wholesale prices again decline, the cost of distribution will remain relatively high for many years.

tion was 40 per cent above prewar. Again at the beginning of World War II farm prices in the United States increased from an index of 124 in 1941 to 186 in 1943 as compared with the advance in the cost of distribution from an index of 167 in 1941 to 171 in 1943. If the wholesale price level declines abruptly following World War II or sometime thereafter, the cost of distribution will lag behind and will continue relatively high for many years.

In the postwar period, following World War II, farmers may well profit by taking an increased interest and participation in the marketing and distribution of their products. In many cases, farmers should own and operate certain marketing facilities. The degree of success in improving the national and international distribution of farm products will depend very largely on a coordinated program of all phases of marketing and distribution with farmers always taking an active part.

SUMMARY AND DISCUSSION

When prices fluctuate, all prices do not change at the same time or at the same rate. This brings about disparity among various prices which is greatly increased during and following major wars. Rapid advances in prices benefit some persons and harm others. In many cases the degree of success that farmers enjoy is closely associated with price conditions during the period they operate their farms. Some young people are ready to begin farming when price conditions are extremely favorable, others when price conditions are very unfavorable. Similar situations exist in other businesses.

Most persons desire a stabilized price level. Such a price level would show minor fluctuations from time to time, but there would be no violent price fluctuations upward or downward. If such a price level could be maintained, prices of all goods and services would automatically fluctuate about and adjust themselves to the same general level. Although our present economic forces are at work to bring about these adjustments, some prices are much slower to adjust than others. When the price level fluctuates violently from time to time, price relationships are seldom in adjustment.

The importance of a stabilized price level has long been recognized. This country and other countries have made many attempts to stabilize prices, especially agricultural prices. Some of these

attempts have been in the form of such measures as acreage adjustments, soil conservation, marketing quotas, and subsidies. During World War II measures have been taken in an attempt to prevent price inflation. To prevent prices from rising rapidly during the present war period is another way of attempting to stabilize prices. The late President Franklin D. Roosevelt had this in mind when he said, "The line must be held." Naturally, there is considerable diversity of opinion as to the relative success of the various methods of preventing price advances. It is probably fair to state that none of the methods or combination of methods were expected to be or have been entirely successful. Also, it is doubtful if complete success in price control can be obtained under free competition and our present monetary system.

The importance of stabilizing prices in agriculture after the war has been recognized by the Government. The Government has taken steps to prevent the farm prices of specified farm products from declining below 90 per cent (95 per cent for cotton) of parity⁵ for two years following the January of the year after World War II. The parity concept was set forth originally in the Agricultural Adjustment Act of 1933. This Act, among other things, declared that it was the policy of the Congress of the United States to "re-establish prices to farmers at a level that will give agricultural commodities a purchasing power with respect to articles that farmers buy equivalent to the purchasing power of agricultural commodities in the base period." While this concept has been amended and revised many times, it remains in principle essentially unchanged.

⁵ Parity and Average Prices Received by Farmers for Agricultural Commodities—December 1944, Bureau of Agricultural Economics mimeographed report. The procedure for computing parity prices for agricultural products as stated in this report is as follows:

(1) A base price is determined. Where satisfactory data are available this is done by averaging the prices received by farmers for the 60 months beginning August 1909 and ending July 1914. The average price of cotton during this period, for example, was 12.4 cents a pound, while corn averaged 64.2 cents a bushel and wheat averaged 88.4 cents a bushel. The base prices for tobacco and for a considerable number of fruits and vegetables, including potatoes, are averages of the season average prices for the marketing seasons falling within the 120 months, August 1919–July 1929, or the 60 months, August 1934–July 1939.

(2) An index of prices paid, including interest and taxes is calculated. To begin with, the prices of 86 items used in family living and 94 items used in farm production are collected. These items include clothing; household supplies; food; furniture and furnishings; building materials; automobiles, trucks, and tractors; feed; farm machinery; fertilizer; equipment

It is reasonable to assume that various methods may be used in attempting to maintain agricultural prices at or above parity. These methods may include commodity loans, subsidies, and direct purchases. The success which our Government will attain in maintaining parity prices during the postwar period will depend partly on the wholesale price level of all commodities for this period. Of course, any success in maintaining prices for agricultural commodities will affect the wholesale price level as the wholesale prices of many agricultural products are included in the price index of all commodities.

It is the author's opinion that in order for this country to have a stabilized price level some simple, effective, and automatic plan of maintaining a reasonably stable *wholesale price index for all commodities* is necessary. When a stabilized price level is established and maintained, industrial wages, rent, agricultural prices, and other prices will gradually adjust themselves to a common level. In addition to stabilizing the index of wholesale prices, some provisions would be needed to meet unusual conditions in industry and agriculture. Until we have a stabilized general price level we may expect violent price changes and maladjustment of prices as in the past.

PRICES OF MAINE FARM PRODUCTS DURING WORLD WAR PERIODS

World war periods bring about unusual and abnormal demand conditions for farm products. Higher prices for farm products during each of the war periods have encouraged farmers throughout

and supplies, including gas, oil, and tires; and seed. The estimated quantity of each commodity bought by farmers is used to combine these prices into an index. Allowances for taxes and mortgage interest payable per acre on farm real estate are also included. This procedure gives an over-all index of 171 for December 15, 1944 which means that farm commodity prices would need to be 171 per cent of the prices prevailing in 1909-14 in order to have the same purchasing power per unit as in 1909-14.

(3) The base prices are adjusted by the index of prices paid, interest, and taxes or by the index of prices paid in case the base period is other than 1909-14. For example, as of December 15, 1944, the parity price for cotton was 1.71 times 12.4 cents or 21.20 cents a pound. The parity price for corn was 1.71 times 64.2 cents or 110 cents a bushel and the parity price for wheat was 1.71 times 88.4 cents or 151 cents a bushel. The parity price of potatoes, however, which is calculated from the base August 1919-July 1929 = 100 was 1.11 times \$1.12 a bushel or \$1.24 per bushel since the index of Prices Paid was 111 as of December 15, 1944 (base August 1919-July 1929 = 100).

the nation to increase greatly their production at a time when shortages existed in labor, equipment, and supplies. Farm families have worked long hours with unusual efficiency in an attempt to increase their incomes and to meet the war requirements. While the successful completion of World War II may be some distance ahead, attention will now be given to probable farm prices and the necessary adjustments in agricultural production in Maine following the present world conflict.

POTATOES

Potatoes represent the most important source of farm income in Maine. During World War I there was little increase in the potato acreage or potato production in Maine. However, a marked increase, both in acreage and production, has occurred in World War II. In World War II our Government established goals and encouraged farmers to increase their potato acreage by incentive payments and by establishing floor prices. Also our rationing and price ceilings of food commodities during World War II were responsible for many changes in consumer food purchases, including potatoes.

The acreage and production of potatoes for the entire country were large for the crop years of 1917 and 1918 of World War I. However, the average production for the two years was considerably less than for the three years 1922-24. In World War II, potato production increased greatly in 1943 over previous years due largely to high yield rates. The most noticeable change which has taken place in potato production during the two war periods is not the increase in acreage but the yield per acre.

Prices received by Maine producers for potatoes depend on many factors, the more important of which under peacetime conditions are total production of potatoes in the United States and the general price level of all commodities for the country. Other factors influencing potato prices are the size of the crop produced in the important commercial areas, the quantity and quality of potatoes arriving at principal markets, transportation facilities, changes in marketing costs, and consumer demands.

Potato prices received by Maine producers show a very close relationship to the prices received by growers throughout the entire United States (Figure 13). This relationship may be expected

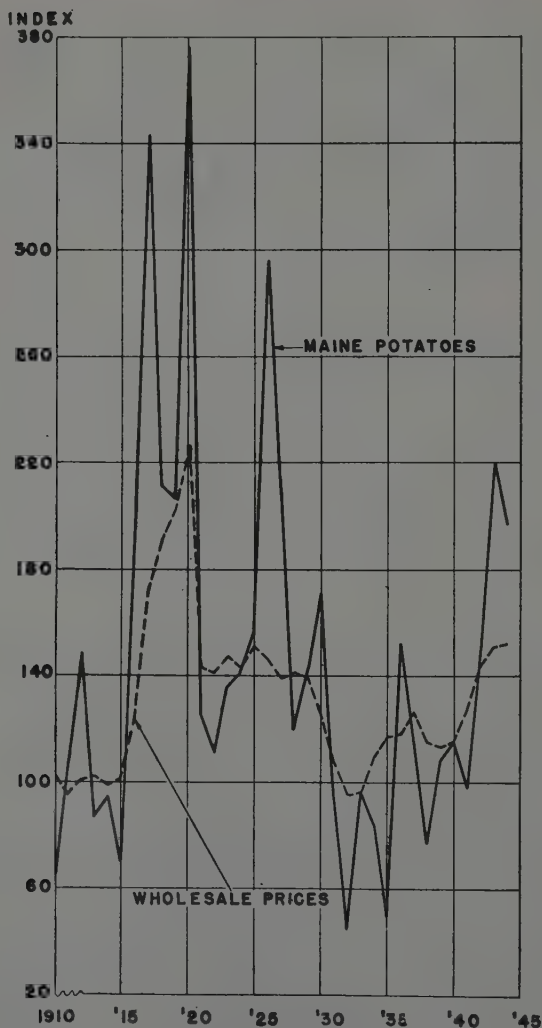


FIG. 12. FARM PRICES OF POTATOES IN MAINE AND WHOLESALE PRICES OF ALL COMMODITIES IN THE UNITED STATES FROM 1910 TO 1944. Potato prices fluctuate violently from year to year due partly to variations in the size of the potato crops in the United States. However, potato prices over a period of years tend to seek the level of wholesale prices of all commodities.

to continue after the war unless temporarily interrupted by Government regulations. Also, potato prices have a tendency to fluctuate violently from year to year but always return to the general level of wholesale prices of all commodities (Figure 12). In the past, the general price level has shown some wide fluctuations due to economic and monetary changes. While the price of potatoes in Maine has had very little effect on the general price level, the price level has influenced the prices growers received for potatoes.

Fluctuations in farm prices of potatoes have been greater than the fluctuations in potato production. This is due to the fact that potato consumption under peacetime conditions is relatively inelas-

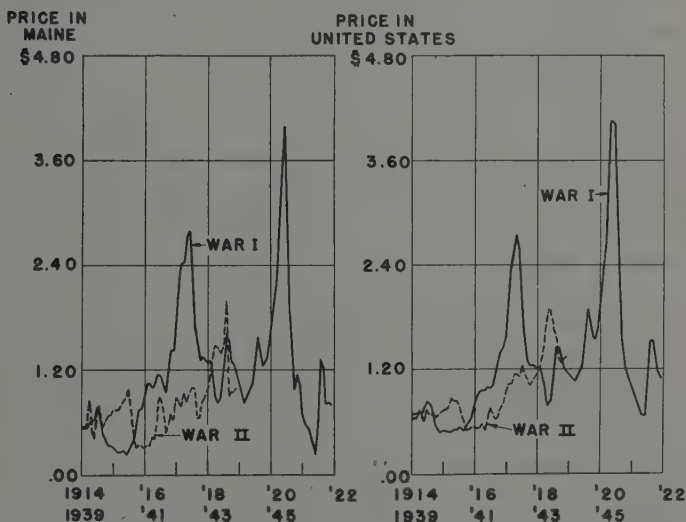


FIG. 13. FARM PRICES OF POTATOES (PER BUSHEL) FOR MAINE AND FOR THE ENTIRE UNITED STATES DURING WORLD WAR PERIODS. Farm prices of potatoes in Maine show similar fluctuations to those of the entire United States. Usually the Maine farm price is somewhat lower than the farm price for the entire country because Maine farmers are farther from the market than the average commercial potato grower in the United States. Price fluctuations in Maine and in the United States were more violent during World War I than World War II. This is due in part to Government regulations attempting to hold the general price level from advancing rapidly as in World War I.

tic, and only a very small proportion of the crop can be stored from one season to another. In a light crop year, potato prices must rise sufficiently high to make the supply last the entire season, while in a large crop year potato prices must be low enough to induce consumers to buy the large crop. Thus, a small variation in the size of the potato crop usually greatly affects the price of potatoes due to this relatively inelastic demand for potatoes.

During the two world war periods the price of potatoes in Maine and the entire United States has been relatively high (Figure 13). Potato prices advanced more violently during World War I than in World War II due chiefly to the size of potato crops produced in the United States during the two war periods. Small potato crops were produced in 1916 and 1919 as compared with average or about average crops during World War II. In Maine, potato prices reached an index of over 340 in 1917 as compared with an index of 220 in 1943. Potato prices in World War II will not approach the high point reached during World War I unless this country should produce a very abnormally short crop of potatoes and the Government raise the ceiling prices accordingly.

The postwar potato price situation will depend on several factors. It is reasonable to assume that those factors which were important before the war will continue to influence potato prices after the war. Perhaps the Government regulations which were taken as war measures have had some influence on the consumer's buying habits which may be carried over in the postwar period. However, it seems doubtful that the general public will continue to consume as many potatoes per capita after the war as during the war period when food was rationed. If this assumption is correct, potato production throughout the country will need to be lowered to obtain reasonable and satisfactory prices. Another factor of paramount importance to potato growers will be the general price level after the war. It has been indicated that the general price level is one of the two most important factors in influencing potato prices.

Farm incomes of potato growers after the war will depend on prices received for potatoes, the size and efficiency of potato production, and efficient methods of handling and marketing the potato crop. With modern potato machinery the cost of producing potatoes per barrel will be much lower on farms with large potato acreages than on farms with small potato acreages. Likewise, in general,

dealers who handle a large volume of potatoes will have lower marketing costs and more effective selling methods than those dealers who sell only a few cars of potatoes each year.

APPLES

The trend in the number of bearing and nonbearing apple trees has been downward in Maine since 1900. According to the 1940 census, Maine had slightly over one-half million bearing trees and 112 thousand nonbearing trees.⁶ This is in contrast to 2.8 million bearing and 512 thousand nonbearing trees reported in 1920.⁷ A large part of this decline in apple-tree numbers has taken place in the so-called farm orchards. Most of these orchards consisted of trees of many varieties and received little care. Farmers in the more favorable areas of the State for apple growing have developed commercial orchards producing quality apples of popular varieties.

The farm price of apples in Maine and the entire United States fluctuates widely from year to year (Figure 14). This is due chiefly to the large variations in the size of apple crops. Many varieties of apples bear heavily in alternate years which has a tendency to widen the fluctuations in production. In general, prices received by apple growers depend on the size of the crop, the general price level, the variety and quality of apples on the market, and the competition with other fruits, especially citrus fruit.

The farm price of apples in the United States and to a lesser degree in Maine has advanced during each of the two world war periods. This advance in price has been due to a higher general price level, increased purchasing power of consumers, and in World War II to the rationing and price ceilings on many competing foods. Prices received for Maine apples by producers in relation to prices of the things they bought have been more favorable during World War II than in World War I. This situation has been caused by the course our Government has taken to prevent price inflation.

Prices received for apples during the postwar period may be

⁶ Merchant, Charles H., *Maine Agriculture in 1940*, A Statistical Presentation, Maine Agricultural Experiment Station, Misc. Pub. 578, November 1943, p. 252.

⁷ Fifteenth Census of the United States, *Agriculture*, Vol. II, Part 1, The Northern States, p. 117.

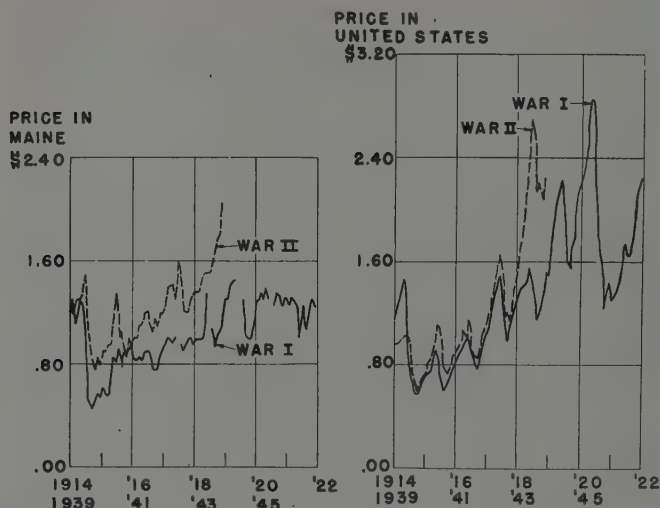


FIG. 14. FARM PRICES OF APPLES (PER BUSHEL) FOR MAINE AND FOR THE ENTIRE UNITED STATES DURING WORLD WAR PERIODS. Farm prices of apples in Maine and the United States advanced during each of the two war periods. The advance was more rapid for the country as a whole than for Maine.

less favorable than during the past few years due to the probable removal of wartime restrictions in food buying, increased competition from citrus fruit, and the probable continuance of the decline in per capita consumption of apples. If apple growers are faced with more competition after World War II, this competition may be best met by (1) the most efficient production methods, (2) the production of quality apples of popular varieties, and (3) distributing apple sales throughout the marketing season. This latter may mean further development of cold storage facilities and the merchandising of the apple crop over a longer marketing season.

In the postwar years ahead apple growers should keep informed as to consumer's dietary habits and as to new plantings of apple and other fruit trees in the United States. In the past there has been a tendency for some growers to set out a large number of trees during periods of high apple prices. This may result in

a larger quantity of apples being placed on the markets ten to twenty years later at relatively low prices.

GRAIN CROPS

Grain production in Maine has become relatively unimportant with the exception of oats. Oats serve as the principal nurse crop (crop to seed down in) and the grain is used for livestock feed. The downward trend in grain acreage in Maine was temporarily checked during World War I. The acreage of grain crops just prior to World War I (oats, barley, buckwheat, wheat, and corn) averaged 176 thousand acres as compared with 148 thousand acres before World War II. During World War I the grain acreage reached 247 thousand acres in 1918. The situation has been about the opposite during World War II. Grain acreage declined to 114 thousand acres in 1943, which was less than one-half the acreage reported in 1918 (Figure 15).

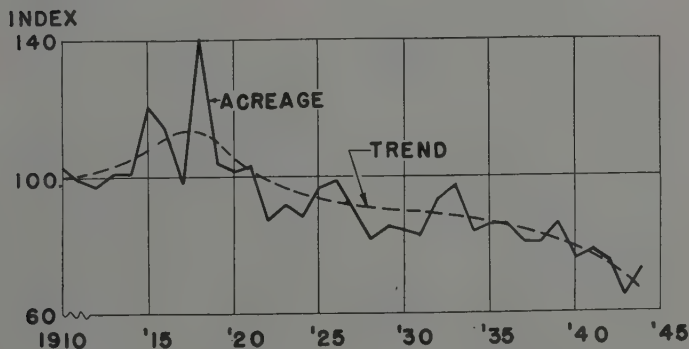


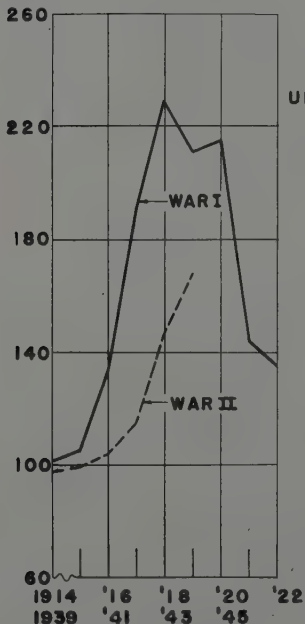
FIG. 15. TREND IN GRAIN ACREAGE IN MAINE FROM 1910 TO 1944. Grain acreage has declined irregularly since World War I. The average grain acreage for 1940 to 1944 was only 73 per cent of the five-year average of 1910 to 1914. Maine is not expected again to produce the grain crops of 20 or 30 years ago.

The national grain situation in World War II is vastly different than that of World War I. During World War I this country had a very limited supply of grain on hand as contrasted with

large surpluses at the outbreak of World War II. Also, improved seed and good weather conditions have produced large grain crops during World War II. Even with large increases in livestock numbers, especially hogs and poultry, the grain supply in this country has not been as critical as it was during World War I.

The composite farm prices of grain crops in Maine and in the United States advanced rapidly during each of the world war periods. Price advances in World War I were more rapid than in

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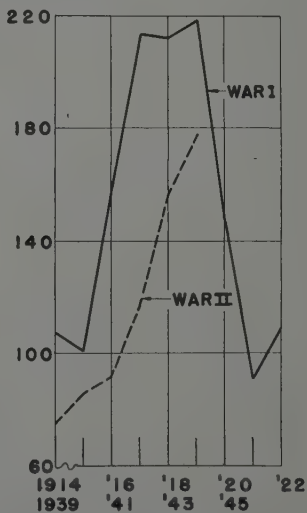


FIG. 16. FARM PRICES OF GRAIN CROPS (PER BUSHEL) FOR MAINE AND FOR THE ENTIRE UNITED STATES DURING WORLD WAR PERIODS. Farm prices of grain crops in Maine and the United States advanced very rapidly during each world war period. The price advances were more pronounced during World War I than may be expected in World War II. A precipitous decline in grain prices occurred in 1920 following World War I. A similar price decline may not follow World War II.

World War II (up to January 1945). The difference in price advances reflects the grain situation during the two war periods and the Government regulations on prices of grain crops and livestock in World War II. Further, with large grain crops in 1944 and with an expected smaller number of livestock animals for the next few years, grain prices are not expected to reach as high a point during World War II as in World War I.

In Maine, farm prices of grain during World War I reached the high index of 229 in 1918, when 1910 to 1914 equals 100, as compared with an index of 212 for the United States for the same year (Figure 16). For World War II, Maine farm prices have advanced less rapidly than for the entire country. Grain prices declined rapidly following World War I due chiefly to the precipitous decline in the wholesale price level. However, following World

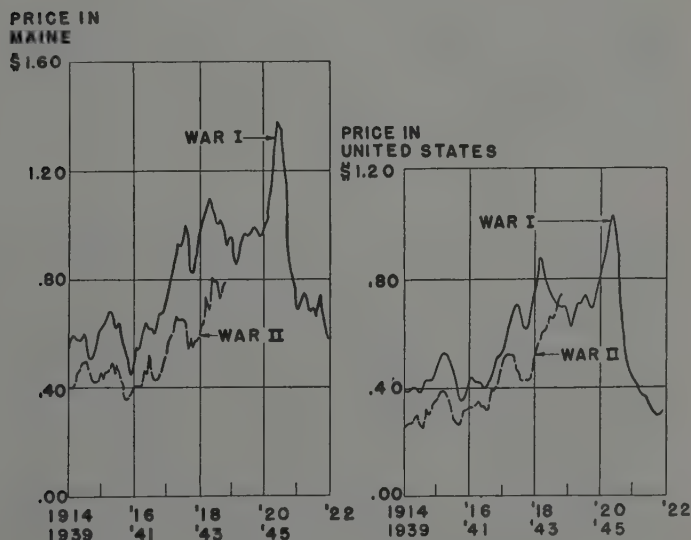


FIG. 17. FARM PRICES OF OATS (PER BUSHEL) FOR MAINE AND FOR THE ENTIRE UNITED STATES DURING WORLD WAR PERIODS. Farm prices received by farmers for oats in Maine and for the entire country advanced rapidly during each world war period. The advance was slightly more rapid during World War I than that which has taken place during World War II.

War II grain prices in Maine and throughout the country are not expected to decline as rapidly or to the same extent as following World War I.

Farm prices of oats in Maine and in the United States have shown advances similar to those of farm prices of all grain crops during each of the world war periods. Usually the farm price of oats in Maine is several cents a bushel higher than that for the entire country due to the cost of transportation of oats from surplus areas to Maine. Aside from this difference there is a great similarity in the farm prices of oats for Maine and for the United States (Figure 17).

In the postwar period only a small amount of adjustment will be needed in grain acreages in Maine. This is in contrast to the situation following World War I when a substantial decrease in grain acreages was necessary. In fact, following World War II some increase in oat acreage may take place with a decline in the acreage of potatoes. Grain crops will continue to be grown in Maine as part of the crop rotation and to produce livestock feed. In addition a few farmers may find it profitable to produce one or more of the grain crops to sell for seed purposes.

HAY

The acreage of hay in Maine has fluctuated rather widely from year to year. However, a downward trend now appears to be in evidence. Under improved cultural methods and fertilization, fewer acres of hayland are needed to produce the roughage requirements for the present number of livestock. Another factor which should be considered is the improvement in hay roughage resulting from earlier cut grasses and newer methods of drying hay which will produce a better livestock feed than was formerly produced.

Hay is a bulky commodity and is expensive to transport from one area to another. This accounts for the wide variations in the price of hay in different localities in the United States and even within the State of Maine. The farm price of hay in Maine increased during each of the world war periods (Figure 18). Much of the increase in price during the World War I period occurred after the Armistice. Some increase in hay prices in the State has taken place since 1941 but the advance in price has been moderate. If this country escapes the disastrous effects of inflation which

occurred following World War I, no appreciable increase in the price of hay may be expected during World War II except where short hay crops may occur locally.

During world war periods, the farm price of hay for the entire United States has averaged about \$4 per ton lower than for Maine. This is due to the fact that Maine farmers are located nearer to markets for livestock products than the average of all farmers in the United States producing these products. This relationship of farm prices of hay in Maine to that of the United States may be expected to continue in the postwar period.

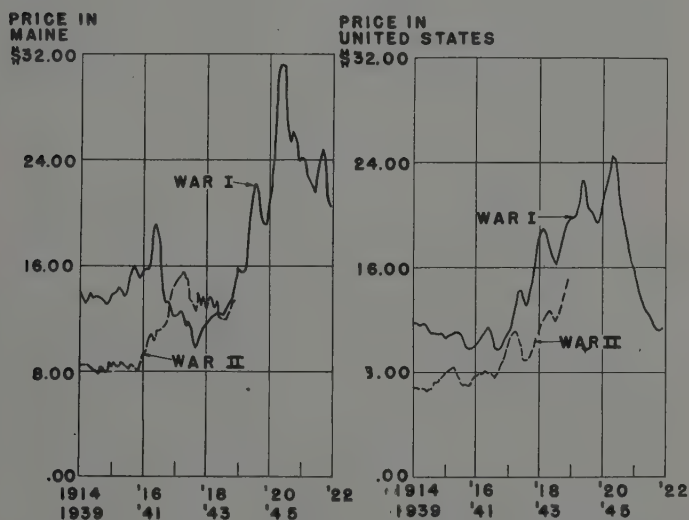


FIG. 18. FARM PRICES OF HAY (PER TON) FOR MAINE AND FOR THE ENTIRE UNITED STATES DURING WORLD WAR PERIODS. Farm prices of hay have shown some advance in Maine and the United States during each world war period. Hay prices are about \$4 a ton higher in Maine than for the entire country.

The farm price of hay reflects the supply of livestock roughage and the returns farmers receive for livestock and livestock products. When livestock products are relatively high priced, there is an increased demand for hay, other roughage, and livestock feed. The

opposite situation exists with low prices of livestock and livestock products.

In the postwar period adjustments will be needed in hay acreage on many Maine farms. The need for these adjustments will be brought about by an increase in the use of automobiles, trucks, and tractors and by the increased production of better quality hay roughage. With these changes in requirements and the improvements in hay roughage, fewer acres of hayland will be needed to supply the roughage requirements of the present number of livestock on Maine farms. Thus, some of the poor hayland may be expected to go out of hay production during the next ten years. Also, better roughage will permit a reduction in grain and feed bills, especially to dairymen of the State. During this somewhat transitional period in hay production, hay prices are expected to be relatively low, especially for low quality hay.

DRY BEANS

Information on the acreage and the production of dry beans in Maine is available only since 1924. Prior to the outbreak of World War II bean acreage in Maine was fairly uniform, averaging about 8,000 acres annually. Farmers were encouraged by the Government to increase their bean acreage in 1943 and as a result 15,000 acres of beans were planted. But due to very unfavorable harvesting conditions only about one-half the acreage was harvested. In 1944 farmers planted only 5,000 acres. Harvesting conditions in 1944 were much more favorable than during the previous year and with present bean prices some slight increase in bean acreage may take place during the next few years.

Farm prices of beans in Maine and the entire United States have advanced rapidly during each of the two world war periods. The advance in farm prices of beans was much more rapid during World War I than during the present conflict (Figure 19). In World War I, the general price level advanced very rapidly and there was strong demand for beans for civilians and armed forces. In contrast, the rise in the general price level during World War II has been less rapid and the increase in demand for beans both by the civilian population and armed forces has been somewhat less active.

Maine farmers will experience no problem in adjusting their dry bean acreage. The probable adjustment may be slightly up-

ward in the postwar era. The farm prices of beans may continue relatively high in relation to the prices of all commodities, especially if employment conditions remain good following the war. Weather at harvesting time is one of the more important limiting factors in growing large acreages of beans in Maine.

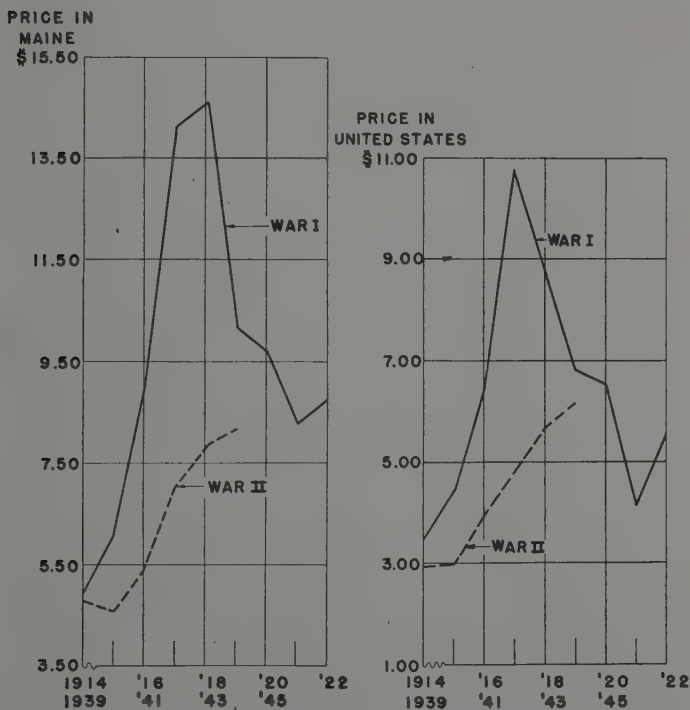


FIG. 19. FARM PRICES OF DRY BEANS (PER HUNDRED POUNDS) FOR MAINE AND FOR THE ENTIRE UNITED STATES DURING WORLD WAR PERIODS. Farm prices of dry beans increased rapidly in Maine and the entire United States during the world war periods. However, the increase was more rapid in World War I than in World War II. This was partly due to the relative advances in the general price level of all commodities during the world war periods.

MILK COWS AND DAIRY PRODUCTS

The general trend in the number of milk cows in Maine since 1910 has been downward. During World War I the number of milk cows in the State increased from 145 thousand head in 1914 to 176 thousand head in 1920. In contrast, the number of cows at the beginning of World War II decreased during the first two years of the war (from 134 thousand head in 1941 to 123 thousand head in 1943) and then showed an increase of ten thousand head during the next two years.*

Three important changes have taken place in the dairy industry in Maine. One is the very rapid increase in the size of many dairy herds and a rapid decline in the number of very small herds. Another is the increase in milk production per cow due to better breeding and feeding practices. The third is the kind of dairy products marketed. During World War I considerable cream and some butter were sold, while in World War II a much higher percentage of the milk has been sold as fluid or market milk.

In contrast to the general downward long-time trend in the number of milk cows in Maine, there has been a definite upward long-time trend in the number of milk cows for the entire country. This upward trend in cow numbers in the United States continued through each of the world war periods.

Price of Milk Cows

During the first part of World War II prices of milk cows in Maine and the entire United States advanced more rapidly than during World War I (Figure 20). The average price of milk cows in Maine advanced from about \$56 per head in 1914 to over \$84 per head in 1919. Milk cow prices during World War II have advanced from \$66 per head in 1940 to over \$134 per head in 1943. Some decline in the price of milk cows took place in 1944 and further price declines may be expected during the next few years.

There are definite cycles in the purchasing power of milk cows⁸ in Maine (Figure 21). The purchasing power of milk cows was at a high point in 1914, in 1930, and again in 1944. These

⁸ Purchasing power of milk cows is the amount that the farm price of an average milk cow will buy in terms of all commodities.

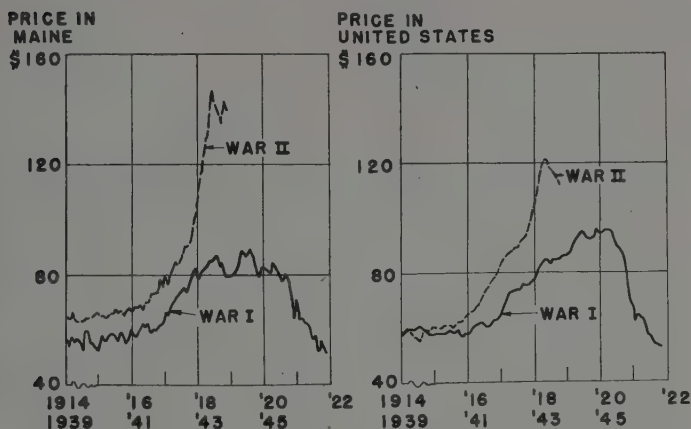


FIG. 20. FARM PRICES OF MILK COWS (PER HEAD) FOR MAINE AND FOR THE ENTIRE UNITED STATES DURING WORLD WAR PERIODS. Farm prices of milk cows in Maine and the entire United States advanced during each world war period. The advance during World War II has been much more rapid than that of World War I.

high points have occurred at intervals of 14 to 16 years. Also, the low points in purchasing power have taken place in about the same length of time. In other words, purchasing power declines for about 7 to 8 years followed by advances for about an equal length of time. It is expected that the purchasing power of milk cows in Maine will soon decline and reach a low point again in about 1952 to 1953. The next high point of the cycle is expected to be 14 to 16 years from the present time or in 1959 to 1961. It is interesting to note that the world war periods have not materially changed the length of the cycles in the purchasing power of cows in Maine.

Price of Milk

The farm price of milk in Maine has advanced during each of the world war periods (Figure 22). There has been no appreciable difference in the rate of advance during the two wars. The increase in the price of milk during a major war is due in part to an increased demand for milk brought about by an increase in the

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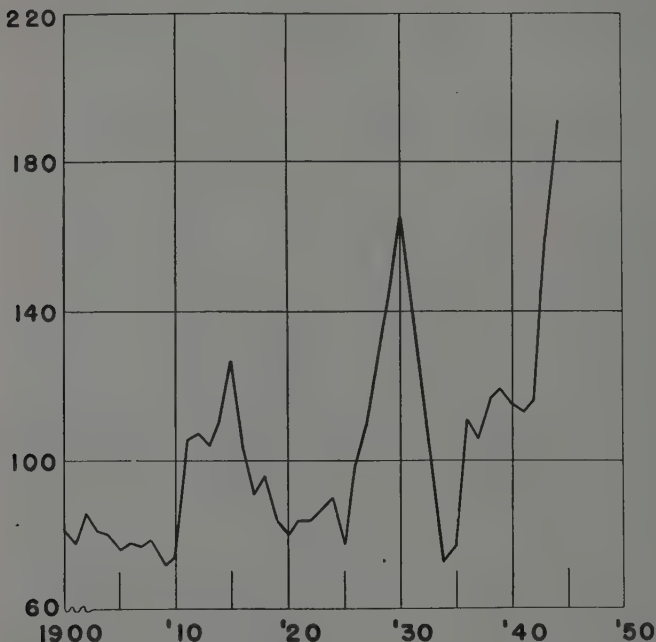


FIG. 21. PURCHASING POWER OF MILK COWS IN MAINE FROM 1900 TO 1944. High points in the cycle were reached in 1914, in 1930, and again in 1944. The next peak is likely to occur in 1959 to 1961. The next low point in the cycle is expected to occur about 1952 to 1953.

purchasing power of consumers. On the other hand, as the purchasing power of consumers declines, as in a depression, less milk is purchased and a decline in the farm price of milk occurs. From a nutritional standpoint it would be very desirable if milk consumption could be established at high levels during both depressions and periods of full employment.

There is a definite seasonal variation in the price of milk in Maine (Figure 23). In World War I, the index of seasonal variation varied from 85 in June to 114 in January. This may be com-

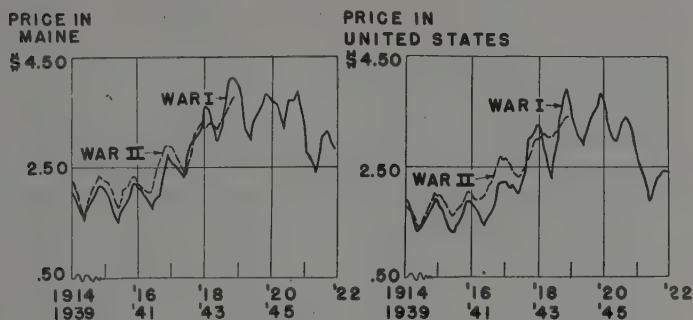


FIG. 22. FARM PRICES OF MILK (PER HUNDRED POUNDS) FOR MAINE AND FOR THE ENTIRE UNITED STATES DURING WORLD WAR PERIODS. Farm prices of milk have advanced in Maine and the United States during each world war period. The farm price of milk declined with the general price level following World War I. A similar decline may be expected after the present world conflict if unemployment should develop.

pared with the seasonal range of 88 in June to 110 in November and December during World War II. Seasonal variation in milk prices will be important following World War II, and dairymen should give careful consideration to the practicability of more equal distribution of milk production throughout the year. Obviously it is possible to produce milk cheaper during the summer months when the cows are on pasture than when cows are in the barns.

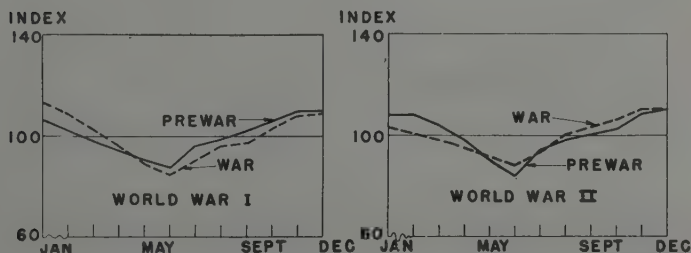


FIG. 23. SEASONAL VARIATION IN THE FARM PRICE OF MILK IN MAINE DURING PREWAR AND WAR PERIODS. There has been a definite seasonal variation in the price of milk in Maine preceding and during world war periods. The farm price of milk is the lowest in June and the highest in November and December.

Also of equal importance are the market demands for milk and dairy products.

Price of Butter

The farm price of butter in Maine and the entire United States has advanced during each world war period (Figure 24). The advance in price during World War II (up to 1945) has coincided almost exactly with that of World War I. The price of butter has been consistently higher in Maine than for the entire country. Maine is a deficit butter-producing state and much butter consumed in the State comes from the Middle West. Maine farmers were not subsidized for butter production when the Government set the price ceiling on retail butter and subsidized butter production in the West. This has encouraged some farmers to change from butter production to that of fluid milk.

Following World War I the price of butter declined at about the same time and rate as wholesale prices of all commodities. If employment is maintained at satisfactory wage levels after World War II, butter prices will move upward unless prevented by Government regulations. But on the other hand, if unemployment develops, the price of butter in Maine and the United States may decline.

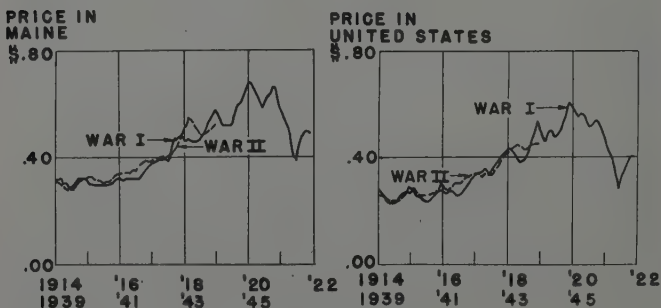


FIG. 24. FARM PRICES OF BUTTER (PER POUND) FOR MAINE AND FOR THE ENTIRE UNITED STATES DURING WORLD WAR PERIODS. Farm prices of butter in Maine and for the entire United States have advanced fairly rapidly during each world war period. The advance in prices up to 1945 in World War II has coincided with that of World War I.

Price of Veal Calves

The farm price of veal calves in Maine and in the entire United States advanced very rapidly during the war periods (Figure 25). In fact, advances in veal prices in Maine during the two war periods coincide very closely. For the United States, the advance in veal prices during World War II has been at about the same rate as World War I. However, the price of veal calves was somewhat higher at the beginning of World War I than World War II. Like the price of milk and other dairy products, the price of veal calves is influenced by the number of dairy animals and the general level of wholesale prices of all commodities.

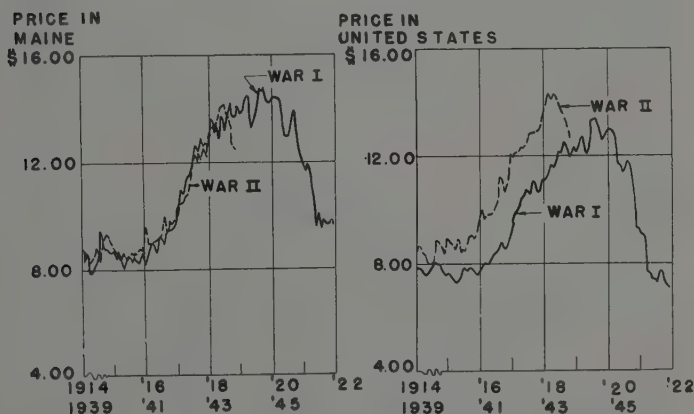


FIG. 25. FARM PRICES OF VEAL CALVES (PER HUNDRED POUNDS) FOR MAINE AND FOR THE ENTIRE UNITED STATES DURING WORLD WAR PERIODS. Farm prices of veal in Maine and the United States have advanced at practically the same rate during the world war periods. The price of veal calves is influenced by the level of wholesale prices of all commodities.

Unlike prices of milk and butter there is little seasonal variation in the farm price of veal calves in Maine. While more veal calves are sold during the spring and early summer months, the farm price has shown only a very moderate decline for that period. The demand for native veal in Maine markets has far exceeded the supply, and most veals are sold directly to local dealers and butchers.

OTHER CATTLE

The term "other cattle" includes all cattle except dairy cows and heifers two years old and over kept for milk production. In Maine, other cattle consists chiefly of dairy bulls and heifers less than two years old, while in the range areas of the West other cattle is made up largely of beef animals. However, information on the number of beef animals in Maine is not available over a period of years and it is necessary to use the number of other cattle.

The number of other cattle in Maine has declined since about 1880. Then there were over 200 thousand head of other cattle in Maine as compared with less than 100 thousand head during the last 10 years. This indicates a reduction of one-half the number of other cattle in about 60 years. In contrast to the downward trend in the number of other cattle in Maine, there has been an upward trend in the number of other cattle in the United States during the same period. In 1880, over 21 million head were re-

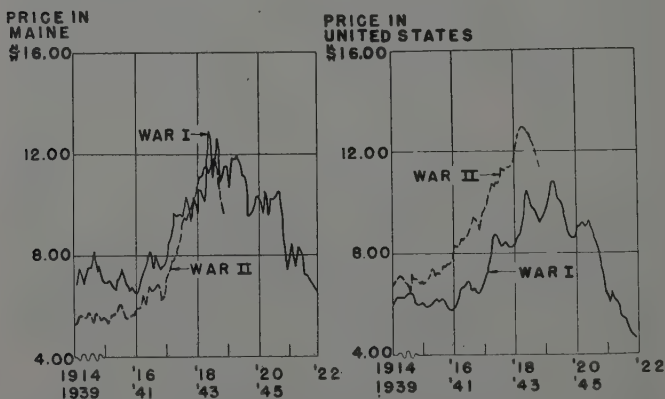


FIG. 26. FARM PRICES OF BEEF CATTLE (PER HUNDRED POUNDS) FOR MAINE AND FOR THE ENTIRE UNITED STATES DURING WORLD WAR PERIODS. Farm prices of beef cattle have advanced rapidly in Maine and the entire United States during the world war periods. Following World War I a rapid decline in the farm prices of beef cattle occurred. If the general price level declines after World War II we may expect a drastic decline in beef cattle prices.

ported for the country as compared with nearly 55 million head in 1944.

Price of Beef Cattle

The farm price of beef cattle in Maine and in the United States advanced rapidly during each world war (Figure 26). There was comparatively little difference in the rate of the price advance in Maine and the entire country. During World War I, the farm price of beef in Maine increased from slightly less than \$7 per hundredweight in 1915 to over \$11 per hundredweight in

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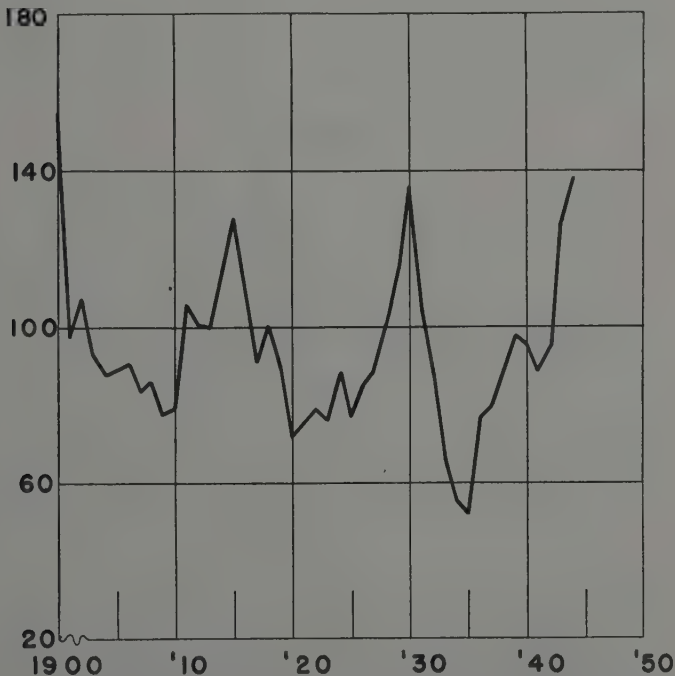


FIG. 27. PURCHASING POWER OF OTHER CATTLE IN MAINE FROM 1900 TO 1944. High points in the purchasing power of other cattle have occurred in 1915, in 1930, and again in 1944 or 1945. After these peaks, the purchasing power of other cattle has declined for five to seven years.

1918. Beef prices began to decline rapidly in 1920 and reached their prewar level two years later. In World War II, the farm price of beef in the State advanced from over \$6 per hundredweight in 1941 to nearly \$11 per hundredweight in 1943. Since 1943, farm prices of beef have declined to less than \$9 per hundredweight. This decline may be the beginning of a downward movement in the farm price of beef cattle.

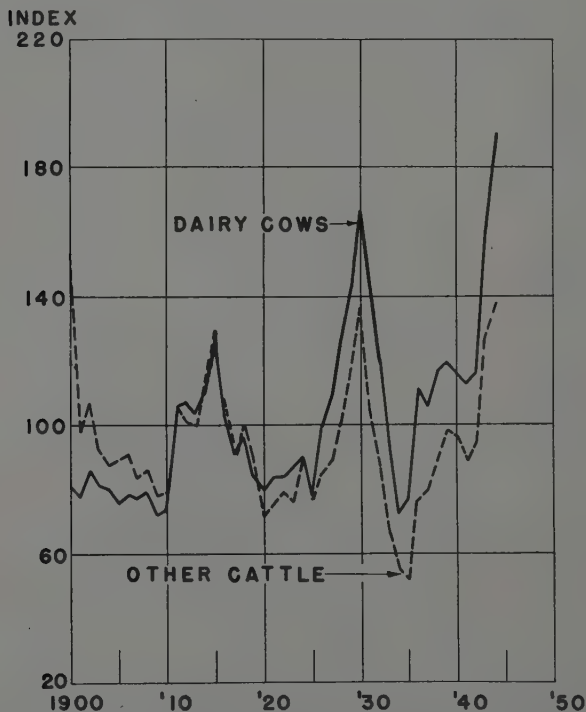


FIG. 28. COMPARISON OF PURCHASING POWER OF OTHER CATTLE AND DAIRY COWS IN MAINE FROM 1900 TO 1944. The purchasing power of other cattle has coincided very closely with the purchasing power of milk cows since 1900. The high and low points in the purchasing power of the other cattle and milk cows have occurred at approximately the same time.

The farm price of beef cattle in Maine during World War I was considerably higher than the farm prices of beef cattle for the entire United States. In World War II, Maine beef prices have been lower than those for the United States.

The purchasing power of other cattle in Maine has followed definite cycles similar to those of milk cows (Figure 28). High points in the purchasing power of other cattle have occurred in 1915, and in 1930 (Figure 27). The next high point was reached in 1944 or will be attained within the next year or two. The low points have occurred in 1909, in 1920, and in 1935. The next low point is likely to occur in about 1952 to 1955. These cycles in the purchasing power of other cattle have occurred almost without interruption in war and in peace. During the first years of the postwar period we may expect a decline in the purchasing power of other cattle in Maine. Also, it is reasonable to expect that the purchasing power will continue to decline for five to seven years.

POULTRY AND EGGS

Information on the number of chickens⁹ has been reported annually for Maine since 1924 and for the United States since 1920. The number of chickens in the State since 1924 has shown minor fluctuations without any definite upward or downward trend until the beginning of World War II. Since 1942, the number of chickens increased from about two and a quarter million to nearly three million birds in 1944.

There has been a slight upward but irregular trend in the number of chickens on farms in the entire United States from about 1920 to 1942. Since 1942 very large annual increases in the number of birds have occurred.

Price of Chickens

Prices received for chickens by Maine producers have advanced rapidly during each of the world war periods (Figure 29). The rate of increase has been very similar during each war period. Also, prices received by producers throughout the United States have averaged about the same as those for Maine.

When the wholesale price level rose at the beginning of each

⁹ Birds of all ages *excluding* broilers.

world war, wages lagged behind retail prices, and consumers purchased chickens sparingly as they were somewhat of a luxury. With a decline in the wholesale price level, which occurred about two years after World War I, wages again lagged and remained relatively high for some time resulting in a larger demand for poultry even though at high prices. During World War II the Government rationed many food products including various kinds of meats but excluded poultry. Such a program at a time when the purchasing power of consumers was high, greatly increased the demand for poultry meat and helped to bring about a shortage in poultry.

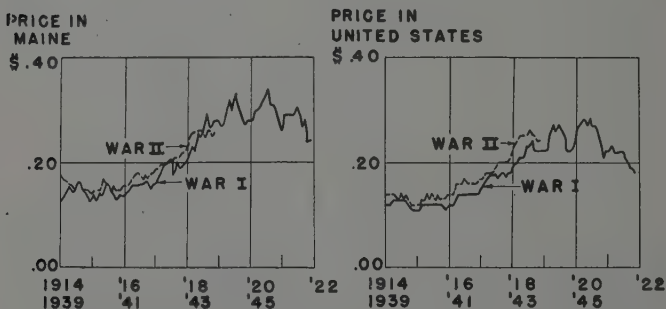


FIG. 29. FARM PRICES OF CHICKENS (PER POUND) FOR MAINE AND FOR THE ENTIRE UNITED STATES DURING WORLD WAR PERIODS. Farm prices of chickens have advanced very rapidly during each world war period. It is expected that chicken prices will remain relatively high during and for a short time after World War II as they did following World War I.

As long as full employment, Government purchases of poultry for armed forces, and rationing continue, poultry meat will be relatively high. As in World War I, wages may be expected to decline less rapidly than prices after World War II furnishing a relatively good market for poultry. This favorable situation may continue for several years. However, Maine poultrymen may expect much competition from Midwestern poultry producers after the present war.

Price of Eggs

The farm price of eggs has shown a marked increase during world war periods (Figure 30). There has been much similarity in the upward trend in Maine and in the United States. In the past 25 years the farm price of eggs in Maine has shown minor fluctuations around the wholesale price level of all commodities in the United States. Under free competition this relationship would be expected to continue after World War II. However, with the Government attempting to regulate both the production and the price of eggs in World War II, egg prices may not follow the same general course as during and after World War I.

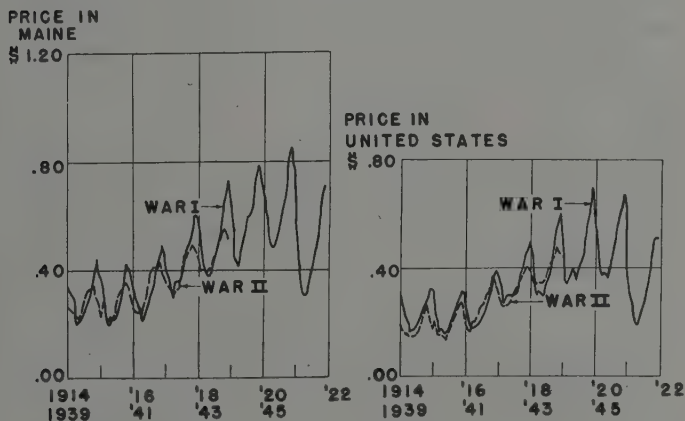


FIG. 30. FARM PRICES OF EGGS (PER DOZEN) FOR MAINE AND FOR THE ENTIRE UNITED STATES DURING WORLD WAR PERIODS. Farm prices of eggs in Maine and the United States advanced during each world war period. This upward trend in prices has been much the same for Maine as for the entire United States.

There is a very definite seasonal variation in the farm price of eggs in Maine (Figure 31). This seasonal variation has changed rather materially during the two world war periods. Preceding and during World War I, egg prices were relatively low during the months of April and May, advanced to a high point in December, and rapidly declined until the next April. In World War II, egg

prices have also been the lowest in April and May, but the advance from May was less rapid than in World War I and terminated in November rather than in December. While egg prices during World War II began to decline in December and continued to decline until April, the price range was less pronounced than in World War I. Much of the change in seasonal variation during the two world war periods has come about as a result of poultrymen now hatching their pullets at an earlier date and the Government regulating egg prices.

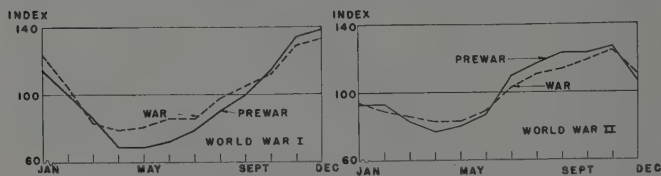


FIG. 31. SEASONAL VARIATION IN THE FARM PRICE OF EGGS IN MAINE DURING PREWAR AND WAR PERIODS. The seasonal variation in the prices of eggs has changed materially during the two world war periods. There has been less seasonal variation in egg prices in World War II than in World War I. This situation is likely to continue after World War II.

SHEEP AND WOOL

The sheep industry in Maine has declined since the Civil War. In 1867, there were 896 thousand sheep in the State as compared with 43 thousand in 1944. This is a reduction of nearly 95 per cent in the past 77 years. During the last 30 years the number of sheep has declined from 148 thousand to 43 thousand or 78 per cent. The number of sheep in Maine increased slightly after the first two years of each world war. The number increased from 125 thousand to 127 thousand in World War I as compared with an increase from 41 thousand to 43 thousand in World War II.

The number of sheep in the entire United States has fluctuated widely since the Civil War, varying from about 30 million to 57 million head. These variations in the number of sheep have occurred in irregular cycles. A slight increase in the number of sheep has taken place during each world war period. During World War I the number increased about three million from 1917 to 1919

and in World War II four million from 1940 to 1942. However, a decrease in the number of sheep occurred shortly after World War I and since 1942 of World War II.

Price of Sheep

The farm price of sheep in Maine and in the entire United States advanced during each of the world war periods. However, the advance in price has been less rapid during World War II than that which occurred in World War I. In World War I, the farm price of sheep in Maine advanced from slightly over \$5 per hundredweight in 1915 to over \$10 per hundredweight in 1918. After prices had reached the peak in 1919 they declined about as rapidly during the next three years as they had advanced in the previous three years. The situation has been somewhat different during World War II. The farm price of sheep in Maine began to

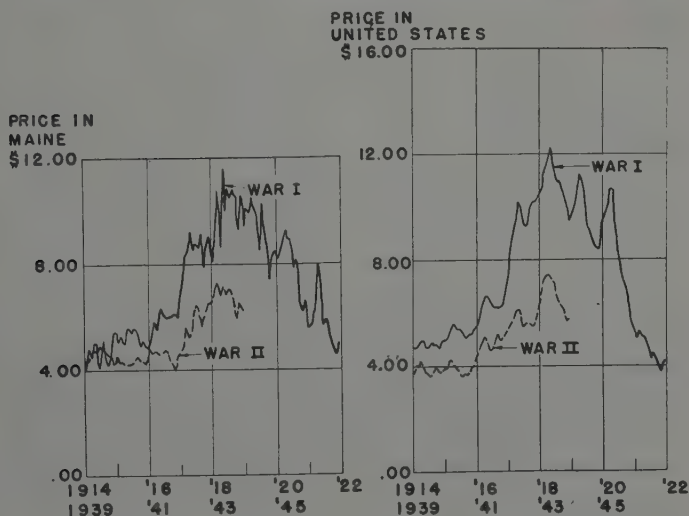


FIG. 32. FARM PRICES OF SHEEP (PER HUNDRED POUNDS) FOR MAINE AND FOR THE ENTIRE UNITED STATES DURING WORLD WAR PERIODS. Farm prices of sheep advanced very rapidly in Maine and in the entire United States during World War I. The advance in the prices of sheep has been much slower and of shorter duration during World War II. The farm price of sheep declined through the year 1944.

advance slowly in 1941 and the advance continued for about two years followed by a price decline in 1944. The price fluctuations of sheep in Maine during each world war period have been very similar to those for the entire United States (Figure 32).

The purchasing power of sheep in Maine has shown fairly regular cycles for the past 45 years (Figure 33). The high points in purchasing power have occurred in 1908, 1919, 1930, and probably in 1943. This is an average of about 11 years between high points in the purchasing power of sheep. While there may be some variation in the length of the next cycle, the purchasing power is not expected to reach another high point until about 1952 to 1956. The present period of relatively high purchasing power may be continued for a few years through Government action. However, purchasing power is expected to decline for several years before it again shows any appreciable increase.

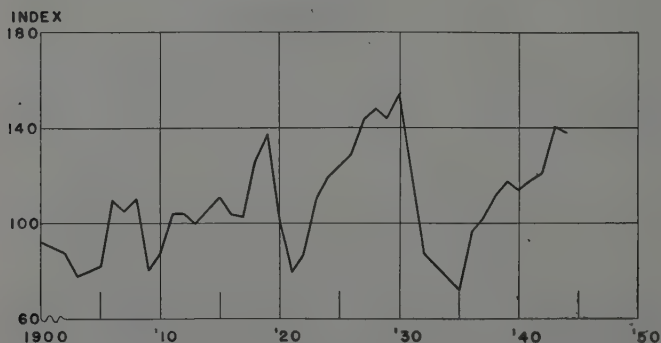


FIG. 33. PURCHASING POWER OF SHEEP IN MAINE FROM 1900 TO 1944. Fairly regular cycles of high and low purchasing power of sheep in Maine have occurred since 1900. The purchasing power of sheep may be expected to be high again in 1952 to 1956.

Price of Lambs

The farm price of lambs in Maine advanced rapidly and at about the same rate during each world war period. The price advance for Maine has been very similar to that for the entire United States. In Maine, during World War I the farm price

of lambs advanced from less than \$7 per hundredweight in 1914 to over \$13 per hundredweight in 1918 (Figure 34). During World War II the average price of lambs increased from \$8 per hundredweight in 1940 to over \$13 per hundredweight in 1943. While the farm price of lambs in Maine declined in 1918, lamb prices remained relatively high until the depression years of the thirties. In World War II, lamb prices have declined in 1944 but they are expected to remain relatively high for several years provided good employment conditions with satisfactory wages continue into the postwar period. Lamb is somewhat of a luxury food and the purchasing power of consumers will materially affect the prices farmers receive for lambs.

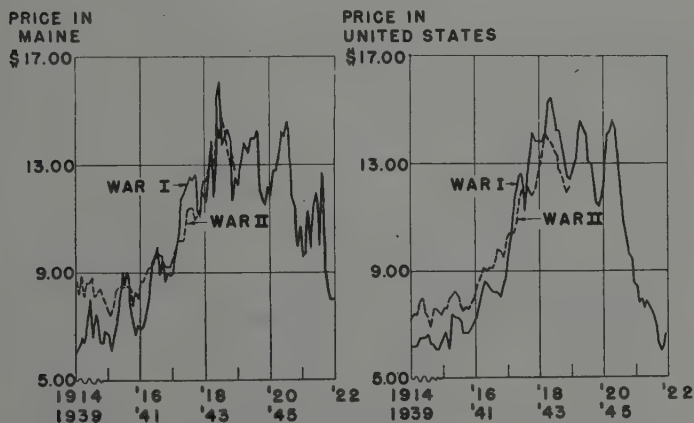


FIG. 34. FARM PRICES OF LAMBS (PER HUNDRED POUNDS) FOR MAINE AND FOR THE ENTIRE UNITED STATES DURING WORLD WAR PERIODS. Farm prices of lambs advanced very rapidly in Maine and in the United States during World Wars I and II. The advance in price was at about the same rate during the two war periods and Maine prices followed very closely those of the entire country.

Price of Wool

The farm price of wool in Maine is influenced by the national and international supply of and the demand for this product. During world war periods there is an increased demand for wool

for military forces. This increase in demand causes advances in the farm price of wool.

The farm price of wool in Maine advanced from 20 cents per pound at the outbreak of World War I to nearly 70 cents per pound in 1918 (Figure 35). This represents an increase of 50 cents a pound or an amount equivalent to three and a half times the prewar price. After the Armistice in 1918 the price of wool declined rapidly and reached the prewar level of about 20 cents a pound in 1921. In 1939, the farm price of wool in Maine averaged about 22 cents a pound. From 1939 the farm price advanced until 1942 at approximately the same rate as during the early part of World War I.

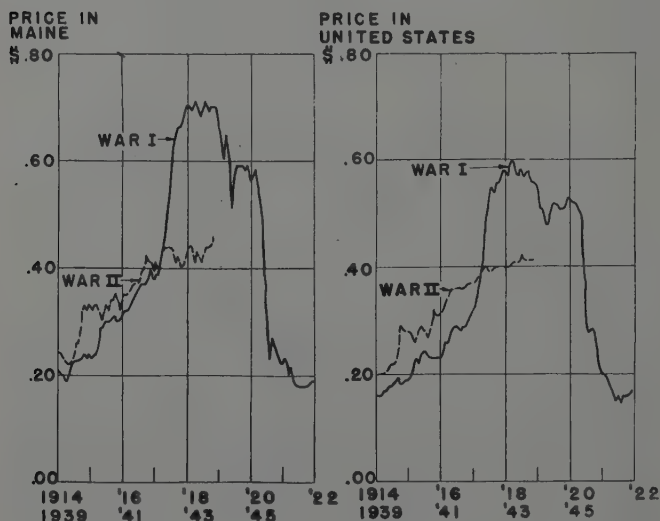


FIG. 35. FARM PRICES OF WOOL (PER POUND) FOR MAINE AND FOR THE ENTIRE UNITED STATES DURING WORLD WAR PERIODS. Farm prices of wool in Maine and in the entire United States advanced rapidly at the beginning of each world war period. The advance was more rapid and of a longer duration in World War I than in the present conflict. The United States' Government took steps to prevent wool prices from reaching as high a level as in World War I.

In 1942, the United States Government passed regulations which in effect practically stabilized the farm price of wool. Also, our Government in cooperation with the British Government has fixed the price of wool on world markets. Therefore it is not expected that the farm price of wool in Maine will reach as high a level as in World War I. Further, if the farm price of wool does not advance much beyond the present level the decline in wool prices, when it occurs, will be less drastic than in World War I. One should not assume that wool prices will decline immediately after World War II. Much will depend on employment conditions and wage levels along with Government regulations to control prices.

The farm price of wool in Maine during each of the two world war periods has averaged slightly higher than the farm price of wool for the entire United States. Maine wool is better in quality than the average for the entire country. Also, Maine farmers producing wool are located nearer to the market than the average farmers keeping sheep in the United States.

Hogs

The raising of hogs in Maine is carried on chiefly as a sideline to utilize unmarketable farm products and kitchen refuse. Farmers in return obtain pork for home use and in some cases may sell part of their product to neighbors and to local butchers. The number of hogs raised in Maine has fluctuated in irregular cycles with a slight downward long-time trend.

The number of hogs in Maine has increased very materially during each of the world war periods. In World War I the number increased from 79 thousand in 1917 to 92 thousand in 1919. During World War II the number has increased from 43 thousand in 1942 to 72 thousand in 1944. A decline in the number of hogs in Maine is expected for the next one to three years. The number of hogs in the entire United States has shown definite cyclical fluctuations. Also, there has been a large increase in the number of hogs during each world war period.

Price of Hogs

During world war periods there has been an increase in the demand for pork and pork products for civilian and military re-

quirements. This situation combined with purchasing power of hogs has resulted in higher hog prices which encouraged farmers to increase their pork production. The farm price of hogs in Maine and in the entire country advanced very rapidly during each world war period (Figure 36). In World War I, the farm price of hogs in Maine advanced from less than \$8 per hundredweight in 1915 to as high as \$19 per hundredweight in 1919. Beginning in 1919 the farm price of hogs in the State declined very rapidly to about \$9 per hundredweight in 1922. In World War II, farm price of hogs advanced from less than \$7 per hundredweight in 1940 to nearly \$15 per hundredweight in 1943. Since 1943 the farm price of hogs in Maine has declined and the price may decline one or two more years. As indicated in Figure 36

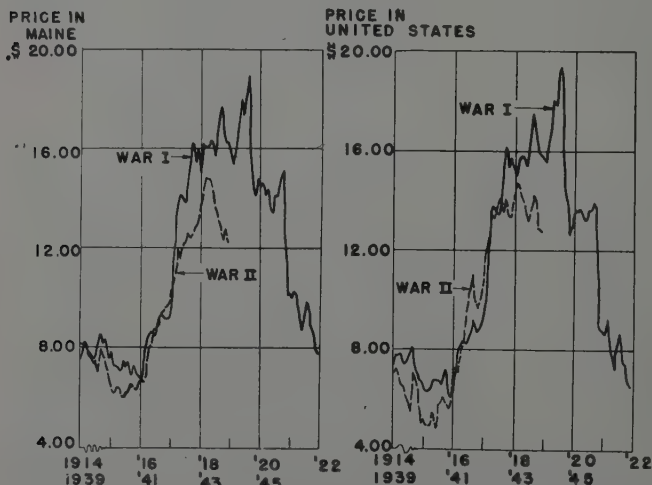


FIG. 36. FARM PRICES OF HOGS (PER HUNDRED POUNDS) FOR MAINE AND FOR THE ENTIRE UNITED STATES DURING WORLD WAR PERIODS. Farm prices of hogs in Maine and in the United States advanced very rapidly during each world war period. Following this rapid advance in the prices of hogs, a drastic decline took place in 1919 after World War I and some decline in hog prices has taken place in 1944 in World War II. The decline in hog prices in World War II may be of relatively short duration and less drastic than at the close of World War I.

similar changes in the farm price of hogs have taken place throughout the entire country during the world war periods.

In war and peace fairly regular cycles occur in the production and farm price of hogs in Maine and in the entire country (Figure 37). These cycles are from four to seven years in length including two to four years of rising prices and two to four years of declining prices. When the price of pork is relatively high, too many pigs are raised in the next two or three years. This situation results in lower pork prices and a decline in the number of pigs raised.

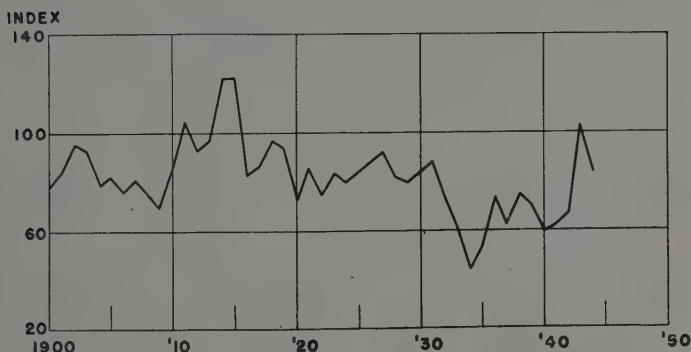


FIG. 37. PURCHASING POWER OF HOGS IN MAINE FROM 1900 TO 1944. Hog cycles are from four to seven years in length with two to four years of rising prices and two to four years of declining prices. Purchasing power of hogs in Maine started downward in 1944 and may be expected to continue downward for one to two more years. Then, the purchasing power of hogs is expected to rise again.

HORSES

The number of horses in Maine has declined rapidly in fairly regular cycles from 106 thousand in 1914 to 35 thousand in 1944. This is a decline of two-thirds in the number of horses in 30 years. A somewhat similar decline has taken place throughout the country. In 1914, 21.3 million horses were reported on farms in the United States as compared with 9.3 million horses in 1944. The drastic decline in the number of horses in Maine and in the entire

United States during the past 30 years has been caused by the increasing use of automobiles, trucks, and tractors. Mechanical equipment has displaced many horses on farms and nearly replaced all horses in villages and cities.

Price of Horses

The drastic decline in the number of horses in Maine since 1914 has been associated with a decline in the average price of horses. The five-year average price of horses from 1910 to 1914 in the State was \$196 per head as compared with \$151 per head for the five-year period 1935 to 1939. The world wars have had little influence on the general trend of prices of horses. During World War I the farm prices of horses declined while in World War II prices of horses have both advanced and declined (Figure 38).

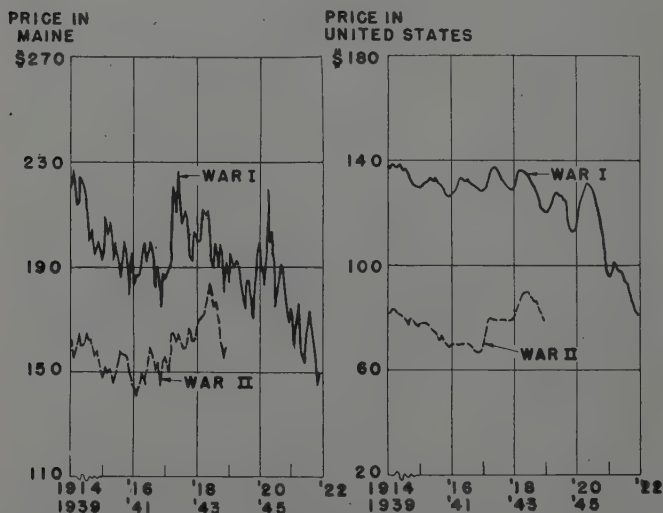


FIG. 38. FARM PRICES OF HORSES (PER HEAD) FOR MAINE AND FOR THE ENTIRE UNITED STATES DURING WORLD WAR PERIODS. World wars have had little influence on farm prices of horses in Maine and in the entire United States. During World War I the price of horses declined while the price of horses has declined and advanced during World War II.

Farm prices of horses for the entire United States have been consistently lower than for Maine. Maine is a deficit area for the production of horses, and farmers must purchase most of their requirements from outside the State. The difference in the average price of horses in Maine and in horse-producing states consists largely of transportation rates, handling charges, and risks involved in shipping and selling horses.

The purchasing power of horses for Maine and for the entire country has followed definite cycles (Figure 39). These cycles are from 20 to 25 years in length with 10 to 12 years of rising purchasing power and 10 to 12 years of declining purchasing power. World war periods have not changed the cycles in the purchasing power of horses.

During the postwar period the number of horses in Maine and in the entire United States is expected to continue to decline but at a somewhat slower rate than during the past 30 years. Auto-

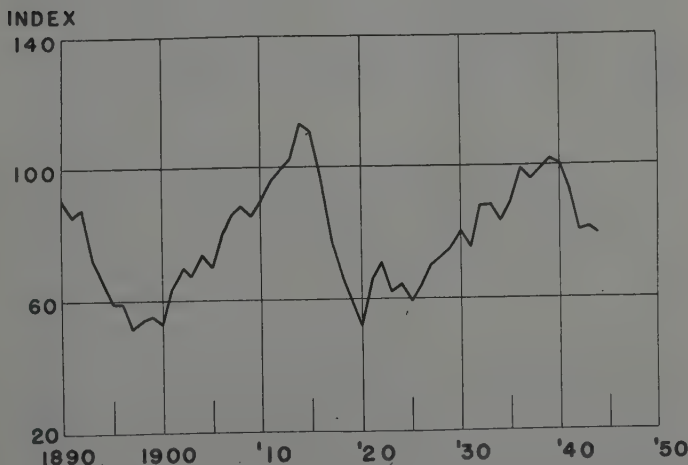


FIG. 39. PURCHASING POWER OF HORSES IN MAINE 1900 TO 1944. The peaks of purchasing power occurred in 1890, 1914, and again in 1939. The number of years between the peaks in the last two cycles has been 24 or 25 years. The next peak will probably occur in 1962 to 1965. In the meantime the purchasing power of horses may be expected to continue to decline until about 1950 to 1953.

mobiles, trucks, and tractors will continue to displace horses year after year. However, some horses will be used on small farms and for certain kinds of work for many years.

FARM PRICES BY TYPES OF FARMING IN MAINE DURING WORLD WAR PERIODS

World wars greatly increased the nation's demands for farm products. These increased demands caused higher farm prices, and higher prices in turn encouraged farmers to increase their production. Many farmers found it necessary to make adjustments in their production programs to meet the wartime requirements. The adjustments were not the same for all agricultural areas or for all farmers in an area. Also, many trends in agricultural production were interrupted by world wars and some persons may think that economic conditions have changed permanently. An illustration during World War I was the great scarcity of wheat flour which encouraged some farmers in the Northeast to grow wheat. Many then made the hasty conclusion that wheat growing would remain important in the area. As everyone knows now the situation was only temporary, and wheat acreage declined shortly after the war.

In the depression which followed World War I, drastic readjustments were necessary in the agriculture throughout the nation and the world. Many of these adjustments were downward in an attempt to reduce the so-called "agricultural surpluses." Again, neither all agricultural areas nor all farmers within the same area shared alike in these adjustments. The economic conditions following World War II will, as has been previously stated, depend on the general course of wholesale prices in the United States. Also, regardless of the price situation this nation will be changing from war to peace, and many adjustments will be needed in agricultural production. Some of these adjustments may be made quickly while others will require years. Also, many adjustments are necessary in agricultural production with the introduction of new farm machinery and with the advancement in scientific knowledge of agricultural production and marketing.

Major wars and postwar periods bring about many adjustments and readjustments in industry as well as in agriculture. In-

dustry must make adjustments to meet the needs of war and later readjust for peace. There is a definite relationship between the prosperity of agriculture and that of industry in war and in peace.

Price is the predominant factor which brings about adjustments both in agriculture and in industry. In agriculture, during war periods, farm prices fluctuate more violently in some sections of the country than in others. This situation is due to the farm products produced and to the relative distances of the areas from markets. When farm prices advance, as during war periods, the increase is more rapid for the same farm products in areas distant from markets. When farm prices decline abruptly, as following World War I, the decline is also more rapid in the agricultural areas located a considerable distance from markets.

TYPES OF FARMING

When farm prices advance in world war periods, the rate of advance is not the same for farmers operating different types of farms. Hence, some farmers are benefited more than other farmers. Likewise, when prices decline, as after World War I, all farm prices do not decline at the same rate. This results in some farmers experiencing a more difficult period of adjustment when prices decline than other farmers.

There are many different types of farming in Maine. The more important of these are potatoes, apples, dairy, and poultry. A brief consideration will be given to the effect of world war periods on each of these types of farms.

Potato-Farm Price Index

There are many different kinds of potato farms in Maine. They vary all the way from highly specialized seed and tablestock farms to general farms with potatoes as an important source of income. Also, these farms are of various sizes ranging from a few acres to several hundred acres of potatoes per farm. In arriving at a basis for a Maine potato-farm price index an approximate average of all these conditions was considered (Appendix A).

The potato-farm price index has fluctuated violently during the 35-year period (1910 to 1944) due to changes in the wholesale price level of all commodities and to the large fluctuations in potato prices resulting from large variations in the size of potato crops

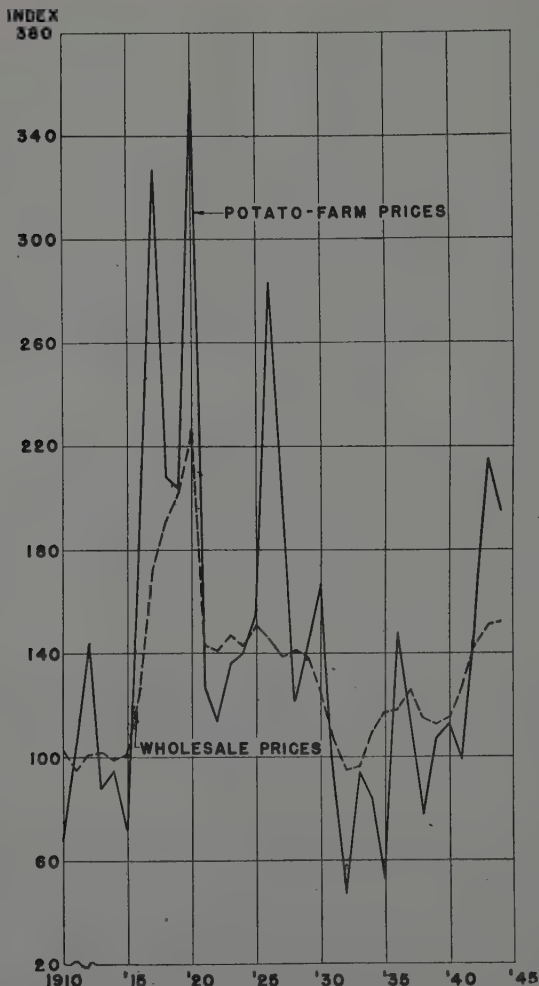


FIG. 40. POTATO-FARM PRICE INDEX FOR MAINE AND WHOLESALE PRICES OF ALL COMMODITIES IN UNITED STATES FROM 1910 TO 1944. The potato-farm price index has fluctuated violently during the past 35 years. Over 90 per cent of potato growers' income is from potatoes and the price of potatoes varies greatly from year to year due to the size of the potato crop in the United States and the wholesale prices of all commodities for the country (general price level).

in the country. During World War I the potato-farm price index rose rapidly to an index of 337 as compared with 100 for 1910 to 1914 (Figure 40). This index of over three times the prewar level was due to the relatively short crop of potatoes in the United States in 1916 and to some advance in the wholesale price level during the early part of World War I. In 1920, the potato-farm price index reached the record high of 361. This was due to the combination of the highest wholesale price index of all commodities and to the short United States crop of potatoes in 1919. The Maine potato-farm price index the following year was only 127, or a little over one-third that of the previous year. In 1926, the potato prices were again extremely favorable with an index of 283. But, for 1932 the potato-farm price index reached the unprecedented low of 47 or a level of less than one-half the average for 1910 to 1914. In World War II the potato-farm price index advanced rapidly and reached an index of 215 in 1943.

The situation potato farmers may expect following World War II will depend largely on three factors. One is the wholesale price level of all commodities in the United States, another is the purchasing power of consumers which will be influenced by employment conditions throughout the country and the world, and the third is the size of the United States potato crops. Unless potato prices can be maintained at a relatively high level after World War II, some of the increased potato acreage in Maine may go into the production of other crops. On the other hand, if prices are maintained at a relatively high level, Maine growers may continue to produce about 200 thousand acres of potatoes annually. Following World War II much consideration should be given to the adjustment of potato acreages within the various production areas.

Apple-Farm Price Index

Most Maine farmers growing apples have other farm enterprises. The more important of these are dairying and poultry raising, with or without canning crops. A highly specialized apple farm may furnish a rather poor distribution of labor throughout the year. This makes it advisable for many orchardists to have other farm enterprises. The apple-farm price index takes into consideration those farming enterprises which a farmer usually combines with orcharding (Appendix A).

The Maine apple-farm price index for 1910 to 1944 has followed much the same general course as the index of wholesale prices of all commodities in the United States with two exceptions (Figure 41). During World War I wholesale prices advanced more rapidly and to a higher level than the apple-farm price index. However, the decline in 1920 was somewhat less. In World War II the apple-farm price index advanced much more rapidly and to a much higher level than wholesale prices of all commodities in the United States. The Government rationing and price regulations to

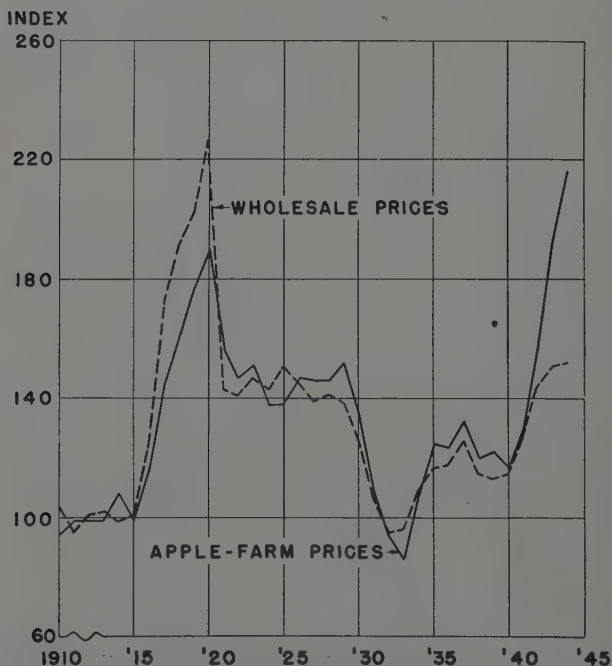


FIG. 41. APPLE-FARM PRICE INDEX FOR MAINE AND WHOLESALE PRICES OF ALL COMMODITIES IN UNITED STATES FROM 1910 TO 1944. The apple-farm price index fluctuated violently during the two world war periods. The index advanced at a slower rate during World War I than World War II. Part of this difference may be attributed to Government programs to prevent price inflation.

prevent price inflation greatly aided the advance of apple prices as apples were not at first included in the program. It is interesting to note that the apple-farm price index for Maine during World War II advanced at about the same rapid rate as the Maine potato-farm price index for the State.

The relatively high prices received for apples and other fruit throughout the United States during World War II has encouraged the setting out of many new orchards especially those for citrus fruit. These orchards will begin to come into bearing five to ten years from now. In five to ten years we certainly may expect World War II to be over and many of the Government regulations to prevent price inflation removed. These conditions may be combined with a lower wholesale price which would mean much lower prices for all fruit including apples. Maine apple growers may best meet the expected postwar situation by (1) lowering the cost of producing apples per unit as far as is practical and consistent with good quality fruit and by (2) developing and enlarging nearby markets for their apples.

Dairy-Farm Price Index

Dairying in various degrees of intensity is found throughout the State. The dairy-farm price index considers all kinds of dairy farms. These farms range from a few cows with other important sources of farm income to highly specialized retail milk farms (Appendix A). Dairying has been referred to as a farm business with a fairly constant income. When dairying is compared with potato or apple growing, such a statement is reasonably correct. However, dairy farm incomes have shown wide fluctuations in the last 35 years.

The dairy-farm price index in Maine has fluctuated rather violently during the two world war periods and the depression in the thirties (Figure 42). The fluctuations in the index are very similar to those of wholesale prices of all commodities in the United States. The advance in the Maine dairy-farm price index during World War I was almost identical with that of wholesale prices. There has been some variation in the two indices since about 1925. Several years prior to the depression of the thirties the index of dairy-farm prices was higher than wholesale prices, but at the bottom of the depression in 1932 and until about 1942 Maine dairy

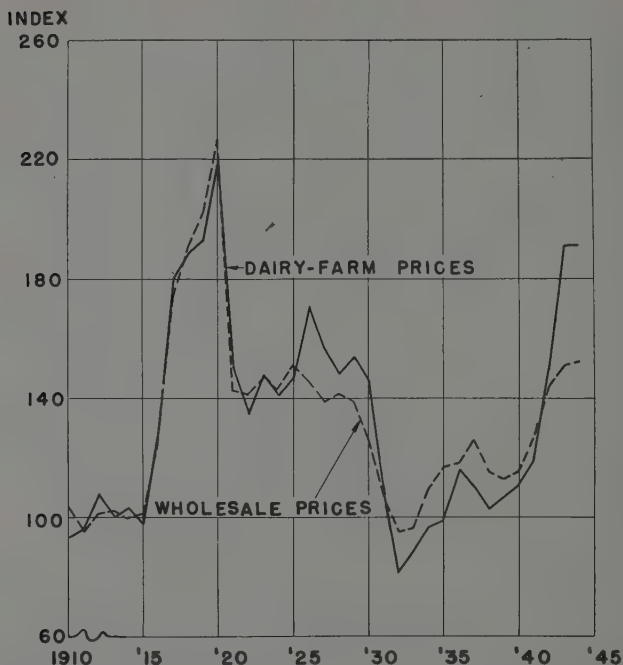


FIG. 42. DAIRY-FARM PRICE INDEX FOR MAINE AND WHOLESALE PRICES OF ALL COMMODITIES IN UNITED STATES FROM 1910 TO 1944. In general, the fluctuations of the dairy-farm price index have been similar to those of wholesale prices of all commodities in the United States. The dairy-farm price index has fluctuated less violently than that for either potatoes or apples.

prices were somewhat lower. However, beginning about 1942 Maine dairy-farm prices advanced much more rapidly than wholesale prices.

The demand for milk and other dairy products increased very rapidly during World War II. This increase in demand for dairy products was caused by large Government purchases of dairy products for military requirements, including lend-lease shipments, and by increased purchasing power of civilians. It has been estimated that with the present purchasing power of consumers, civilians

could have consumed all of the dairy products produced in this country during the present world war without a surplus. However, it has been necessary to ration many dairy products in order to have sufficient quantities available for the military forces and our allies. Following World War II it seems reasonable to expect that the present production of milk and dairy products could be consumed in this country under full employment conditions and high purchasing power of consumers. Also, from a nutritional standpoint the nation could consume more milk and dairy products than are now produced. However, if we experience unemployment and reductions in the purchasing power of consumers, smaller quantities of dairy products will be purchased. Such a situation would bring about lower milk prices to dairymen.

Poultry-Farm Price Index

Poultry is found on nearly every farm in Maine. This farm enterprise varies from a few hens to highly specialized poultry farms of several kinds. Many poultrymen combine other kinds of farming with their poultry business, especially that of dairying. The Maine poultry-farm price index is made up largely of the price of eggs and that of chickens (Appendix A). Unfortunately information is not available to permit including hatching eggs, baby chicks, and breeding stock.

The Maine poultry-farm price index has fluctuated violently since 1910 (Figure 43). These fluctuations have been very similar to those of the wholesale prices of all commodities in the United States. Also, there has been a great similarity in the price indices for poultry and dairy farms in Maine except during World War II. In this period the poultry-farm price index advanced less rapidly than that for dairy farms. However, the poultry index during this period was very similar to that of wholesale prices. The downward trend in the poultry-farm price index occurring in 1943 to 1944 was caused by the abnormally large production of eggs in 1943. As rapid adjustments take place in the poultry business, this situation should be corrected within a relatively short time.

Poultrymen in Maine may expect relatively good returns for poultry products in the postwar period if the purchasing power of consumers remains at a relatively high level. On the other hand, if prices should decline rapidly accompanied by much unemployment, relatively low prices may be received for poultry products.

Before the present world conflict, poultry meat was considered somewhat of a luxury. But, during the war, with consumer purchasing power high and with Government rationing, poultry meat ceased to be a luxury.

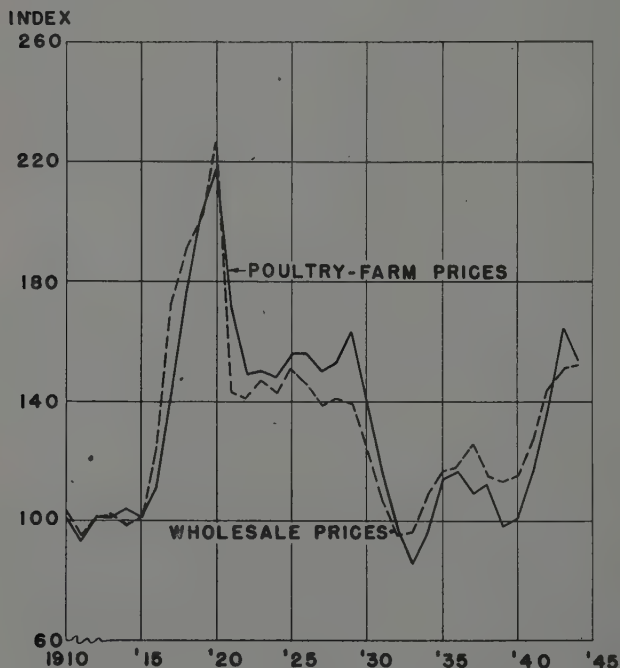


FIG. 43. POULTRY-FARM PRICE INDEX FOR MAINE AND WHOLESALE PRICES OF ALL COMMODITIES IN UNITED STATES FROM 1910 TO 1944. The poultry-farm price index has followed much the same general course as that for dairy farms in the State and the wholesale prices of all commodities in the United States. Following World War II these relationships may be expected to continue.

APPENDIX A—Statistical Tables on the Agricultural Situation
During World War Periods

TABLE 1

Index of Wholesale Prices of All Commodities in United States¹

(1910 to 1914 = 100)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Av.
1800	127	125	125	123	125	127	129	131	133	134	135	134	129
1801	140	142	144	145	146	147	148	146	145	139	136	129	142
1802	126	121	119	117	116	117	117	116	116	115	113	111	117
1803	113	113	114	114	115	116	118	122	123	123	119	122	118
1804	123	123	124	122	120	121	122	124	128	130	134	139	126
1805	140	141	145	144	142	143	140	138	139	139	140	139	141
1806	137	137	134	132	133	132	136	135	135	133	129	130	134
1807	131	133	132	130	131	131	130	129	129	128	127	126	130
1808	124	119	115	112	112	112	112	113	113	113	117	121	115
1809	124	126	135	133	132	132	129	129	130	127	129	128	130
1810	128	130	128	129	131	130	133	132	134	133	133	131	131
1811	132	128	127	127	128	124	124	126	124	125	124	122	126
1812	127	129	128	126	122	125	128	133	135	137	142	144	131
1813	150	152	153	157	160	158	159	161	164	171	178	186	162
1814	186	184	182	182	179	179	178	177	177	183	187	193	182
1815	193	185	176	166	164	165	163	165	166	166	168	163	170
1816	160	160	158	151	150	150	150	149	148	144	145	149	151
1817	152	155	156	156	157	154	149	153	147	145	144	146	151
1818	149	151	149	144	142	144	142	147	146	151	149	145	147
1819	141	137	134	130	125	124	121	119	119	120	117	114	125
1820	114	113	109	106	108	106	104	107	106	103	100	100	106
1821	100	99	98	98	100	99	100	103	105	107	108	109	102
1822	109	108	108	108	107	107	106	104	104	104	106	104	106
1823	104	104	103	103	102	103	104	104	103	102	99	100	103
1824	98	97	97	96	97	98	98	98	98	99	99	98	98
1825	97	98	98	102	106	107	106	105	106	105	104	103	103
1826	103	102	100	100	98	99	101	98	98	98	98	98	99
1827	99	99	99	99	98	97	96	96	96	96	96	99	98
1828	98	97	95	94	94	95	95	95	96	99	99	101	97
1829	102	100	99	99	97	97	93	92	92	92	92	91	96
1830	91	91	91	89	90	91	91	92	93	92	91	90	91
1831	91	92	93	95	95	94	93	92	94	95	96	96	94
1832	100	98	97	93	93	92	92	92	93	94	95	96	95
1833	96	94	93	94	94	93	93	95	96	96	96	95	95
1834	92	92	90	88	88	88	88	89	90	90	90	91	90

¹ Warren, G. F. and Pearson, F. A., Farm Economics, Dept. of Agr. Econ. and Fm. Mgt., New York State Col. of Agr., Cornell Univ., No. 72, September 1931, pp. 1586-87; No. 74, February 1932, p. 1634; Agr. Statistics Yearbook for 1938, U.S.D.A., p. 447; for 1942, p. 650; The Agr. Situation, U.S.D.A., B.A.E., Vol. 27 No. 2, February 1943, p. 24; Vol. 28 No. 3, March 1944, p. 24; Vol. 29 No. 2, February 1945, p. 24.

TABLE 1—(Continued)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Av.
1835	92	93	94	97	100	102	104	104	102	101	102	106	100
1836	107	108	112	116	115	111	110	112	115	120	122	123	114
1837	123	129	127	120	110	110	113	111	107	107	110	114	115
1838	112	109	108	108	109	107	107	107	110	115	115	116	110
1839	117	119	118	119	116	114	111	109	108	106	104	102	112
1840	99	99	97	97	95	93	92	93	94	94	94	94	95
1841	93	93	91	90	91	89	90	92	95	93	92	91	92
1842	90	88	86	84	83	82	81	79	77	77	75	76	82
1843	76	74	73	74	75	75	76	76	77	75	77	77	75
1844	76	77	77	78	78	77	77	77	77	77	78	78	77
1845	79	79	81	83	83	82	82	83	85	85	88	91	83
1846	89	87	86	85	83	81	79	78	78	82	83	83	83
1847	84	90	92	93	93	95	91	88	89	88	89	87	90
1848	85	85	84	84	83	80	79	79	81	82	80	80	82
1849	83	83	83	82	81	80	81	81	83	82	81	82	82
1850	83	84	85	84	84	84	84	83	83	84	85	85	84
1851	87	87	86	85	84	82	81	81	81	81	81	81	83
1852	83	85	87	86	86	86	88	89	90	90	93	94	88
1853	96	97	97	95	94	93	93	95	97	101	102	103	97
1854	105	112	109	109	109	110	106	108	110	105	108	107	108
1855	107	107	109	111	114	115	109	109	109	109	111	112	110
1856	108	107	106	105	102	99	102	104	103	105	107	108	105
1857	111	113	115	114	115	114	114	115	114	106	101	98	111
1858	93	93	95	95	94	92	92	94	94	94	92	93	93
1859	95	99	99	98	97	97	95	92	91	90	92	93	95
1860	94	94	94	93	93	91	92	92	92	93	93	91	93
1861	92	90	90	89	88	85	83	85	86	89	92	94	89
1862	98	99	98	98	95	94	98	105	107	111	120	123	104
1863	126	137	141	137	130	126	127	127	123	134	142	148	133
1864	153	156	161	168	174	189	219	225	225	207	216	222	193
1865	223	217	206	179	169	159	161	168	179	190	189	184	185
1866	182	177	174	167	171	173	175	176	174	180	176	170	175
1867	168	167	166	167	168	159	158	168	158	159	156	155	162
1868	157	158	163	165	163	158	157	158	157	154	153	153	158
1869	155	157	154	151	149	147	148	153	152	149	149	147	151
1870	142	138	135	134	136	135	135	134	134	133	131	128	135
1871	131	135	137	132	129	127	127	125	128	130	130	133	130
1872	133	133	135	138	138	137	135	136	137	134	138	136	136
1873	136	139	139	139	136	132	132	132	132	129	125	128	133
1874	130	130	130	128	127	124	125	124	124	122	121	121	126
1875	121	121	121	122	119	117	117	118	117	117	116	115	118
1876	114	114	114	113	109	106	106	107	108	110	111	113	110
1877	115	112	107	110	112	106	107	103	102	102	100	100	106
1878	97	96	94	93	90	88	89	90	90	89	88	86	91
1879	87	88	87	86	86	85	86	86	89	94	99	102	90

TABLE 1—(Continued)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Av.
1880	105	105	106	102	99	97	97	97	98	98	99	100	100
1881	99	100	100	101	100	100	101	103	107	108	107	107	103
1882	107	108	108	109	110	111	110	111	108	107	106	105	108
1883	105	106	105	104	103	100	98	98	97	97	96	97	101
1884	97	97	97	95	93	93	92	92	91	90	88	87	93
1885	87	88	86	87	85	83	84	84	83	83	84	86	85
1886	84	84	83	82	80	79	80	81	81	81	81	82	82
1887	84	85	85	85	85	84	83	84	83	84	85	87	85
1888	88	87	87	86	85	84	85	85	85	86	87	87	86
1889	84	83	82	82	80	80	80	80	81	81	81	82	81
1890	80	80	80	80	81	81	81	84	85	85	83	83	82
1891	82	83	84	85	84	82	81	81	80	80	79	79	82
1892	77	77	75	74	74	74	76	77	77	77	79	80	76
1893	83	84	82	81	80	78	76	73	76	77	75	74	78
1894	72	71	69	69	69	69	69	71	72	70	70	69	70
1895	69	69	69	72	73	74	73	72	72	72	72	71	71
1896	70	69	69	68	67	66	66	66	66	68	70	70	68
1897	68	68	68	67	66	66	66	69	71	70	70	70	68
1898	70	71	71	71	76	71	70	70	70	70	70	71	71
1899	71	73	73	74	74	75	76	77	80	81	82	83	77
1900	83	84	84	84	82	81	82	81	82	81	81	80	82
1901	81	80	80	79	79	79	80	81	82	82	83	84	81
1902	83	83	83	84	85	86	86	85	86	92	89	90	86
1903	91	91	88	88	86	86	86	86	87	86	85	85	87
1904	87	89	88	87	85	85	85	86	87	87	89	89	87
1905	89	89	88	88	87	87	87	88	87	87	88	89	88
1906	89	89	89	89	90	90	87	89	90	92	93	94	90
1907	93	95	94	94	96	97	97	97	97	98	94	92	95
1908	91	90	90	91	91	91	92	92	92	93	94	95	92
1909	94	95	95	97	98	99	99	100	101	103	104	105	99
1910	104	104	106	107	105	104	104	103	102	99	97	97	103
1911	97	94	95	92	92	92	93	96	97	97	96	95	95
1912	96	97	99	102	102	101	101	102	103	103	103	102	101
1913	103	102	102	102	101	101	102	102	103	103	102	101	102
1914	100	100	99	99	98	98	99	101	103	99	99	98	99
1915	99	100	100	100	101	100	101	100	100	103	105	108	101
1916	112	115	117	119	121	121	122	124	127	133	142	145	125
1917	149	153	157	167	176	178	180	182	180	178	179	180	172
1918	183	179	185	187	187	188	193	196	201	199	199	199	191
1919	196	190	192	194	198	198	206	211	206	207	211	220	202
1920	230	229	232	242	244	243	242	236	227	211	195	176	226
1921	167	153	150	144	141	136	136	137	136	137	138	136	143
1922	134	136	136	136	140	141	145	144	145	145	147	147	141
1923	149	151	153	152	149	147	144	143	146	145	144	143	147
1924	145	146	144	142	140	139	140	142	142	143	145	148	143

TABLE 1—(Concluded)

[illegible]

TABLE 2

Index of Prices Received by Farmers in United States¹

(1910 to 1914 = 100)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Av.
1910	106	104	105	105	102	102	100	99	102	103	101	100	102
1911	100	96	93	92	92	92	94	95	95	95	95	95	94
1912	97	98	98	101	103	100	99	99	99	100	99	98	99
1913	98	99	100	100	99	100	99	101	105	110	109	106	102
1914	105	105	104	102	102	101	102	101	99	97	97	97	101
1915	99	98	96	98	99	97	97	95	97	103	103	103	99
1916	105	106	108	108	109	111	113	119	126	134	140	141	118
1917	142	149	155	170	180	182	181	182	185	192	192	195	175
1918	199	202	201	199	198	194	199	207	216	214	210	212	204
1919	209	199	202	211	217	215	222	223	215	219	227	226	215
1920	228	228	228	234	235	234	227	210	200	188	169	149	211
1921	143	130	114	119	115	112	117	123	127	133	130	127	124
1922	121	128	130	129	134	135	134	130	130	134	141	144	132
1923	144	144	144	145	141	139	137	136	143	146	148	148	143
1924	148	146	140	141	139	136	138	146	139	147	147	151	143
1925	156	155	158	153	153	155	158	159	154	157	158	156	156
1926	155	155	150	152	149	146	142	140	144	140	141	139	146
1927	138	138	136	135	137	139	140	142	149	149	150	151	142
1928	152	149	150	153	156	151	154	148	151	151	149	152	151
1929	149	148	150	148	145	144	149	151	150	150	150	150	149
1930	147	143	139	139	136	131	121	118	122	116	112	107	128
1931	103	99	100	99	93	87	87	84	82	80	82	79	90
1932	74	71	74	71	65	61	64	66	67	66	66	66	68
1933	61	57	59	61	70	73	83	80	80	79	81	79	72
1934	78	84	85	85	84	86	87	95	101	100	100	101	90
1935	109	114	113	115	111	107	104	105	105	107	108	111	109
1936	109	111	107	108	105	108	115	121	121	118	119	122	114
1937	126	127	131	132	128	125	126	120	117	112	108	106	122
1938	103	99	100	98	95	96	98	93	95	95	97	99	97
1939	96	95	95	94	93	91	91	89	98	99	100	98	95
1940	100	103	103	102	101	97	97	96	98	100	103	104	100
1941	107	107	108	115	116	120	126	130	138	136	137	143	124
1942	148	150	151	155	154	154	157	160	163	167	170	177	159
1943	181	184	192	197	194	195	193	192	193	194	194	196	192
1944	196	195	196	196	194	193	192	193	192	194	196	200	195

¹ Index Numbers of Prices Received by Farmers, 1910-1943, U.S.D.A., B.A.E., February 1944, p. 22; The Agricultural Situation, U.S.D.A., B.A.E., Vol. 29 No. 2, February 1945, p. 24.

TABLE 3

Index of Prices Received by Maine Farmers¹

(1910 to 1914 = 100)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Av.
1910	91	89	83	77	73	71	79	83	89	91	91	88	84
1911	81	80	78	81	79	89	117	126	115	112	115	122	100
1912	131	136	148	155	153	142	113	100	97	97	99	98	122
1913	94	93	88	84	94	98	82	89	103	107	106	104	95
1914	103	103	103	102	101	101	108	102	96	94	89	87	99
1915	83	79	74	74	71	69	70	77	91	114	126	123	87
1916	133	143	144	139	139	155	146	133	141	169	186	184	151
1917	200	248	267	269	282	305	245	198	200	198	196	189	232
1918	193	199	180	158	146	156	178	203	221	215	209	196	188
1919	188	171	165	168	168	182	203	212	216	213	214	222	194
1920	246	265	291	343	387	434	350	234	200	200	209	187	277
1921	153	135	128	120	103	92	120	177	188	164	159	151	141
1922	143	149	151	132	116	111	113	119	119	119	120	119	126
1923	120	124	138	147	134	123	130	143	116	154	143	141	138
1924	144	146	140	138	142	146	145	159	126	120	117	113	136
1925	110	120	108	101	96	113	119	172	147	191	247	234	146
1926	257	252	255	331	226	185	166	166	161	168	193	179	210
1927	174	168	163	155	186	220	185	181	163	158	163	150	172
1928	150	159	187	181	121	99	97	117	128	122	122	117	133
1929	116	113	110	109	118	106	119	201	186	203	182	171	145
1930	179	171	153	179	152	148	138	133	146	141	131	121	148
1931	120	113	114	117	100	98	102	103	96	83	82	73	100
1932	69	65	68	66	66	54	53	87	65	70	67	73	67
1933	67	58	60	63	56	68	117	152	115	103	100	100	89
1934	102	113	117	108	84	76	75	87	82	78	81	76	90
1935	75	78	77	86	70	62	61	66	82	93	118	107	81
1936	101	108	116	133	124	161	153	123	124	128	124	141	128
1937	150	140	143	126	107	110	97	104	84	86	92	86	111
1938	84	91	99	87	87	101	93	79	84	100	95	103	92
1939	101	101	101	122	88	80	108	110	103	112	117	111	104
1940	113	117	116	119	118	124	127	104	92	89	89	85	108
1941	83	84	86	95	90	122	130	119	111	127	133	124	109
1942	145	142	141	151	138	149	147	147	136	145	156	157	146
1943	166	177	206	213	203	206	203	233	171	184	179	177	193
1944	181	179	180	182	174	176	169	179	191	200	195	202	184

¹ Index computed by using the following weights: 1,900 bushels of oats, 24 bushels of barley, 2,018 bushels of buckwheat, 2,080 tons of hay, 311,668 bushels of potatoes, 17,344 bushels of apples, 12 bushels of corn, 47,310 pounds of butter, 38,880 hundredweight of milk, 248.96 head of cows, 663.89 hundredweight of beef cattle, 5,332 pounds of wool, 64,524 pounds of chickens, 124,833 dozens of eggs, 116.49 hundredweight of sheep, 230.633 hundredweight of lambs, 1,427.41 hundredweight of hogs, and 948.5 hundredweight of veal calves. After applying these weights the monthly and yearly averages for the years 1910 to 1914 were taken as a base.

TABLE 4

*Index of Prices, Taxes, and Wages Paid by Farmers in the United States
and Farm Real Estate Values for the Entire Country*

Year	Index of amounts paid by farmers (1910 to 1914 = 100)			Farm real estate values ³ (1912 to 1914 = 100)
	Prices paid ¹	Farm taxes ²	Farm wages ¹	
1910	98	92	97	
1911	101	98	98	
1912	100	96	101	97
1913	101	108	103	100
1914	100	110	101	103
1915	105	112	103	103
1916	124	112	113	108
1917	149	114	141	117
1918	176	112	177	129
1919	202	116	207	140
1920	201	155	242	170
1921	152	184	155	157
1922	149	188	151	139
1923	152	198	169	135
1924	152	202	173	130
1925	156	210	176	127
1926	155	220	179	124
1927	153	225	179	119
1928	155	231	179	117
1929	154	233	180	116
1930	146	255	167	115
1931	126	278	130	106
1932	108	294	96	89
1933	108	251	85	73
1934	122	233	95	76
1935	125	224	103	79
1936	124	222	111	82
1937	131	225	126	85
1938	123	227	125	85
1939	121	227	123	84
1940	122	231	126	84
1941	131	216	154	85
1942	152	192	201	91
1943	167	169	264	99
1944	176*		302*	114

* Computed from reports, Agricultural Prices, U.S.D.A., B.A.E., monthly mimeo. publication for 1944.

¹ Index Numbers of Prices Received by Farmers 1910-43, U.S.D.A., B.A.E., February 1944, Mimeo., p. 36.

² Computed from Farm-Property Taxes, U.S.D.A., B.A.E., Mimeo., Nov. 1941, pp. 34-35; and Farm Real Estate Taxes in 1943, U.S.D.A., B.A.E., Mimeo., July 1944.

³ The Farm Real Estate Situation, 1943-44, U.S.D.A., Cir. No. 721, Jan. 1945, p. 4.

TABLE 5

*Index of Taxes and Wages Paid by Maine Farmers and
Farm Real Estate Values in Maine*

Year	Index of amounts paid by farmers (1910 to 1914 = 100)		Farm real estate values ³ (1912 to 1914 = 100)
	Farm taxes ¹	Farm wages ²	
1910	92	95	
1911	94	98	
1912	95	101	100
1913	110	101	102
1914	111	104	98
1915	112	108	96
1916	103	115	98
1917	112	146	110
1918	105	184	115
1919	104	196	124
1920	134	227	142
1921	135	163	132
1922	135	150	127
1923	145	167	129
1924	141	174	127
1925	137	165	124
1926	151	176	126
1927	150	178	124
1928	157	180	124
1929	157	183	122
1930	171	182	124
1931	186	157	123
1932	207	112	114
1933	190	96	94
1934	209	108	94
1935	208	112	94
1936	209	114	95
1937	217	126	97
1938	233	121	96
1939	223	125	94
1940	250	130	95
1941	244	159	95
1942	243	208	97
1943	215	271	99
1944		325	112

¹ Computed from Farm-Property Taxes, U.S.D.A., B.A.E., Mimeo., Nov. 1941, pp. 34-35; and Farm Real Estate Taxes in 1943, U.S.D.A., Mimeo., July 1944.

² Computed from Crops and Markets, U.S.D.A., Vol. 19 No. 5, May 1942, pp. 114-118; and quarterly reports from 1942 to 1945.

³ The Farm Real Estate Situation, 1943-44, U.S.D.A., Cir. No. 721, Jan. 1945, p. 4.

TABLE 6

Index of Freight Rates and the Cost of Distribution of Food

Year	Index of freight rates ¹ (1913 = 100)		Cost of distribution of food in United States ² (1910 to 1914 = 100)
	Potatoes in Maine	Fruits and Vegetables in United States	
1910			92
1911			98
1912			102
1913	100	100	104
1914	104	100	105
1915	104	100	105
1916	104	100	110
1917	112	101	129
1918	143	125	159
1919	143	125	174
1920	200	161	202
1921	195	158	190
1922	179	149	175
1923	179	148	177
1924	179	146	180
1925	179	146	185
1926	179	146	192
1927	179	146	190
1928	179	143	190
1929	179	142	198
1930	179	145	196
1931	179	145	178
1932	179	143	153
1933	175	138	141
1934	173	135	158
1935	166	133	175
1936	166	130	173
1937	168	130	181
1938	164	133	174
1939	157	132	171
1940	157	130	167
1941	157	129	167
1942			179
1943			171
1944			164*

* Preliminary.

¹ Agricultural Statistics Yearbook for 1942, U.S.D.A., p. 652.² Farm Economics, Dept. of Agr. Econ. and Fm. Mgt., New York State College of Agr., Cornell Univ., Ithaca, N. Y., No. 50, p. 835; No. 111, p. 2685; and No. 143, p. 3641.

APPENDIX B—Statistical Tables on Prices of Maine Farm Products During World War Periods¹

TABLE 1

Price of Potatoes in Maine During the First and Second World Wars

Month	World War I								World War II							
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945	1946
	(cents per bushel)								(cents per bushel)							
Jan.	54	32	93	166	130	105	176	72	55	75	32	90	100	110		
Feb.	54	29	105	222	132	92	200	58	55	75	34	85	110	105		
Mar.	54	26	104	242	112	84	226	55	55	75	34	80	140	105		
Apr.	60	28	100	245	90	91	293	50	85	80	44	95	150	110		
May	62	28	104	272	82	98	366	38	49	85	42	85	145	110		
June	62	24	116	280	88	106	399	23	40	90	75	95	140	110		
July	76	27	115	228	123	140	320	60	75	100	90	100	150	110		
Aug.	71	34	105	172	162	158	185	133	80	70	75	100	200	125		
Sept.	48	40	95	144	154	138	110	122	55	40	48	65	90	115		
Oct.	39	60	117	130	132	124	99	82	60	32	60	65	95	115		
Nov.	34	75	143	136	127	130	116	84	70	35	70	85	95	115		
Dec.	34	76	144	130	115	146	105	82	70	34	65	90	100	130		
Av.	54	40	112	197	121	118	216	72	62	66	56	86	126	113		

Price of Potatoes in United States During the First and Second World Wars

Month	World War I								World War II							
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945	1946
	(cents per bushel)								(cents per bushel)							
Jan.	69	50	79	160	122	115	198	101	64	74	55	98	118	141		
Feb.	70	50	91	207	122	112	231	90	65	75	55	104	126	139		
Mar.	70	49	96	238	106	107	270	81	65	77	54	104	145	137		
Apr.	71	49	96	257	86	112	345	73	75	88	58	116	167	137		
May	71	51	97	277	78	120	407	68	66	84	53	115	191	134		
June	76	51	101	261	85	125	404	68	61	86	65	111	188	125		
July	84	54	99	209	118	161	344	103	76	82	76	126	167	138		
Aug.	81	53	102	155	145	190	244	153	69	68	69	115	159	159		
Sept.	70	50	111	131	146	176	160	153	69	60	64	108	134	147		
Oct.	58	55	124	125	135	158	127	131	66	52	67	102	128	142		
Nov.	51	61	141	125	123	156	116	117	69	52	77	108	133	143		
Dec.	49	66	147	122	118	169	110	109	71	55	83	112	135	150		
Av.	68	53	107	189	115	142	246	104	68	71	65	110	149	141		

¹ Material for tables in this section, unless otherwise indicated, is taken or computed from U.S.D.A., B.A.E. reports on Agricultural Prices.

TABLE 2

Price of Apples in Maine During the First and Second World Wars

Month	World War I								World War II							
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945	1946
	(cents per bushel)								(cents per bushel)							
Jan.	120	53	95	90	95	130	130	131	125	80	95	120	135	200		
Feb.	130	60	83	95	100	130	130	126	120	90	100	125	135	215		
Mar.	110	56	83	100	100	140	135	132	125	90	100	140	135	215		
Apr.	115	55	85	100	100	145	130	129	130	95	110	140	145	215		
May	130	68	83	96	100	145	140	125	130	95	110	140	150	215		
June	125	85	90	100	135		130	100	130	120	120	130	150	185		
July	100	80						125	150	135	120	160	150	190		
Aug.	52	92	90	95	107	130	125	108	105	100	110	140	155	190		
Sept.	47	75	75	90	93	104	135	107	90	105	105	120	165	205		
Oct.	45	90	75	95	102	100	133	125	80	90	115	120	175	185		
Nov.	50	90	75	100	105	100	125	130	75	85	110	120	180	205		
Dec.	55	91	85	100	110	110	130	125	85	100	120	130	205	200		
Av.	85	73	83*	96*	101*	123*	131*	124	106	93	108	130	158	204		

* Average of monthly prices given.

Price of Apples in United States During the First and Second World Wars

Month	World War I								World War II							
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945	1946
	(cents per bushel)								(cents per bushel)							
Jan.	111	69	86	104	133	149	216	131	95	73	90	116	160	273		
Feb.	123	73	90	114	138	160	229	133	96	81	93	120	171	294		
Mar.	129	73	91	127	143	190	237	135	98	85	97	130	185	307		
Apr.	137	80	95	137	144	204	254	142	100	90	106	141	215	317		
May	146	91	98	143	156	221	286	162	102	101	101	156	240	319		
June	136	90	105	146	145	223	249	174	102	111	114	166	270	314		
July	91	78	86	125	126	188	197	165	90	108	95	152	255	263		
Aug.	69	62	81	101	114	161	152	165	66	79	85	116	216	212		
Sept.	62	58	76	97	119	153	135	171	63	76	85	120	220	210		
Oct.	56	66	82	105	129	176	126	196	59	72	87	114	208	205		
Nov.	57	72	92	117	139	185	131	216	62	75	98	124	224	210		
Dec.	57	77	103	127	151	214	143	224	68	86	109	143	264	233		
Av.	99	74	90	120	136	185	196	168	83	86	97	133	219	263		

TABLE 3

Price of Oats in Maine During the First and Second World Wars

Month	World War I								World War II							
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945	1946
	(cents per bushel)								(cents per bushel)							
Jan.	54	62	50	71	94	96	100	69	40	45	40	51	58	100		
Feb.	58	63	55	78	100	87	102	70	40	43	41	58	63	100		
Mar.	59	66	54	82	104	85	110	73	40	46	41	59	65	100		
Apr.	58	68	56	85	106	91	119	74	45	46	41	63	73	105		
May	58	68	62	93	110	94	132	71	47	49	46	66	69	110		
June	58	62	64	92	106	97	138	68	49	45	45	65	80	110		
July	60	62	62	92	102	96	136	70	49	48	52	65	79	100		
Aug.	56	64	62	100	100	97	124	66	49	45	43	65	79	95		
Sept.	51	58	60	94	102	99	106	70	45	41	43	54	73	80		
Oct.	51	55	66	82	99	98	88	74	42	36	43	58	78	85		
Nov.	54	51	68	82	92	95	80	63	42	36	46	55	79	80		
Dec.	60	45	68	88	94	96	78	58	42	38	48	58	85	80		
Av.	56	60	61	87	101	94	109	69	44	43	44	60	73	95		

Price of Oats in United States During the First and Second World Wars*

Month	World War I								World War II							
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945	1946
	(cents per bushel)								(cents per bushel)							
Jan.	39	48	42	53	76	68	80	44	26	36	33	50	52	78		
Feb.	39	51	44	56	82	63	84	42	26	38	33	52	56	79		
Mar.	39	53	42	59	88	64	88	41	27	39	34	52	58	79		
Apr.	40	53	42	66	87	68	94	38	27	39	35	52	61	79		
May	40	52	42	70	82	71	101	37	30	37	34	52	61	80		
June	39	49	41	69	77	71	104	37	30	33	33	46	65	79		
July	38	46	40	71	75	73	93	35	26	28	33	44	66	76		
Aug.	40	42	42	68	72	74	76	32	25	27	32	43	65	71		
Sept.	43	36	44	62	71	70	65	31	32	27	40	43	70	64		
Oct.	43	35	47	62	70	69	58	30	30	28	39	43	74	66		
Nov.	43	36	51	64	70	70	50	30	32	32	41	44	75	66		
Dec.	44	38	52	70	71	74	46	31	35	32	45	47	77	69		
Av.	41	45	44	64	77	70	78	36	29	33	36	47	65	74		

* Mean of prices reported on 1st of month and 1st of succeeding month, Aug., 1909-Dec., 1923.

TABLE 4

Price of Barley in Maine During the First and Second World Wars

Month	World War I								World War II							
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945	1946
	(cents per bushel)								(cents per bushel)							
Jan.	82	82	76	106	135	146	155	108	70	70	60	75	95	125		
Feb.	78	82	82	100	140	145	162	110	70	70	70	80	100	125		
Mar.	78	84	84	102	182	146	172	114	65	75	70	80	100	125		
Apr.	80	88	82	111	204	140	178	113	70	77	75	85	110	135		
May	81	85	94	126	191	135	204	117	65	77	75	93	115	135		
June	80	84	104	154	235	151	228	135	70	80	75	84	115	140		
July	86	84	100	144	251	168	235	155	70	72	75	80	115	135		
Aug.	91	80	92	112	214	160	202	135	70	65	75	80	120	124		
Sept.	88	76	94	105	180	158	166	118	75	60	75	80	120	110		
Oct.	84	75	99	113	164	168	142	113	65	60	70	85	125	120		
Nov.	80	76	102	126	156	169	132	94	60	60	70	90	125	110		
Dec.	82	77	106	130	148	168	126	90	65	55	70	90	125	110		
Av	82	81	93	119	183	154	175	117	68	68	72	84	114	124		

Price of Barley in United States During the First and Second World Wars*

Month	World War I								World War II							
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945	1946
	(cents per bushel)								(cents per bushel)							
Jan.	52	59	58	90	129	89	134	61	38	46	42	61	68	108		
Feb.	52	65	61	95	146	86	133	57	38	46	42	63	71	109		
Mar.	51	66	58	100	166	89	135	56	38	46	42	62	75	110		
Apr.	50	64	58	111	164	98	143	52	38	46	45	62	77	111		
May	49	63	60	120	147	107	147	50	39	45	46	62	77	113		
June	48	59	59	113	127	109	145	51	39	41	46	59	84	112		
July	46	56	59	111	114	114	132	50	36	36	45	56	92	110		
Aug.	49	54	66	112	105	117	113	48	34	36	43	57	93	103		
Sept.	52	49	75	112	98	115	98	46	43	37	52	57	96	95		
Oct.	52	48	80	113	95	116	86	44	42	38	49	58	103	95		
Nov.	53	51	86	112	93	119	76	42	42	41	53	58	103	96		
Dec.	54	53	88	120	92	125	68	43	44	42	56	62	105	98		
Av.	51	57	67	109	123	107	118	50	39	42	47	60	87	105		

* Mean of prices reported on 1st of month and 1st of succeeding month, Aug., 1909-Dec., 1923.

TABLE 5

Price of Buckwheat in Maine During the First and Second World Wars

Month	World War I								World War II							
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945	1946
	(cents per bushel)								(cents per bushel)							
Jan.	68		70	88	176	180	165	102	75	80	75	78	100	130		
Feb.	66		72	85	192	188	171	105	75	80	80	85	100	125		
Mar.	64		76	80	200	192	174	105	75	80	80	90	100	120		
Apr.	63		84	94		182	162	100	80	85	80	90	109	125		
May	61	75	86	131		175	150	102	80	85	85	95	120	135		
June	66	82	81	192		175	150	110	85	85	85	100	115	145		
July	70	86	88	216		166		124	85	90	90	105	120	145		
Aug.		74	91	175		156		128	75	85	90	105	125	140		
Sept.		62	92	142	206	150		120	75	75	85	100	135	120		
Oct.	54	65	102	136	178	162	125	108	75	75	80	110	135	140		
Nov.	58	70	100	145	172	175	139	100	80	75	75	100	135	130		
Dec.	70	70	92	158	165	168	129	100	75	78	78	100	130	128		
Av.	64*	73*	86	137	184*	172	152*	109	78	81	82	96	119	132		

* Average of monthly prices given.

Price of Buckwheat in United States During the First and Second World Wars*

Month	World War I								World War II							
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945	1946
	(cents per bushel)								(cents per bushel)							
Jan.	76	81	81	116	162	160	153	122	54	63	55	69	88	135		
Feb.	75	85	82	120	165	153	155	118	54	62	55	75	97	133		
Mar.	76	85	83	127	169	149	159	113	55	64	55	76	104	130		
Apr.	77	85	84	139	173	148	166	113	54	66	57	81	109	131		
May	78	86	86	167	184	156	174	116	55	67	58	83	114	133		
June	82	90	90	196	196	163	191	116	56	67	59	86	118	138		
July	83	91	91	199	197	163	192	118	56	69	63	86	125	136		
Aug.	80	85	88	177	192	163	179	117	55	65	64	88	120	129		
Sept.	79	78	88	159	185	161	168	110	60	61	66	85	111	114		
Oct.	78	76	97	154	176	156	145	95	63	54	64	77	114	102		
Nov.	77	79	108	157	170	149	130	83	62	53	64	76	123	98		
Dec.	77	80	115	161	165	148	127	82	62	54	65	80	132	97		
Av.	78	83	91	156	178	156	162	109	57	62	60	80	113	123		

* Mean of prices reported on 1st of month and 1st of succeeding month, Sept., 1909-Dec., 1923.

TABLE 6

Price of Corn in Maine During the First and Second World Wars

Month	World War I								World War II							
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945	1946
	(cents per bushel)								(cents per bushel)							
Jan.	86	86	90	124	202	176	174	118	65	75	75	85	95	130		
Feb.	84	89	90	130	209	172	186	102	68	70	79	85	100	135		
Mar.	84	91	90	133	211	168	194	98	71	75	80	85	100	135		
Apr.	82	92	90	146	205	180	192	112	71	75	80	94	105	135		
May	82	90	92	164	196	182	208	110	75	75	80	94	107	135		
June	85	89	94	168	222	190	227	100	72	75	87	96	110	140		
July	86	91	94	186	210	220	226	106	72	75	91	100	110	145		
Aug.	94	94	100	198	208	230	202	106	68	75	91	100	115	145		
Sept.	99	94	106	207	186	211	182	97	80	75	90	100	120	145		
Oct.	94	88	123	222	181	197	152	90	73	73	85	95	120	145		
Nov.	89	84	128	224	174	194	129	84	69	70	85	95	120	140		
Dec.	86	87	122	216	168	185	128	78	69	72	80	95	130	140		
Av.	88	90	102	176	198	192	183	100	71	74	84	94	111	139		

Price of Corn in United States During the First and Second World Wars

Month	World War I								World War II							
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945	1946
	(cents per bushel)								(cents per bushel)							
Jan.	69	70	64	93	137	141	144	65	45	53	56	73	88	113		
Feb.	69	74	67	98	147	138	148	63	44	55	56	77	90	113		
Mar.	70	75	69	107	154	143	154	64	44	56	57	78	95	114		
Apr.	71	76	71	132	155	156	164	61	45	59	62	80	100	115		
May	74	78	73	155	154	167	177	61	48	63	66	81	103	115		
June	75	78	75	162	153	174	185	62	50	64	68	82	106	115		
July	76	78	77	181	157	184	175	62	48	63	70	83	108	117		
Aug.	79	78	82	186	163	188	160	59	46	63	70	83	109	117		
Sept.	80	74	83	175	163	170	138	54	56	62	71	83	109	116		
Oct.	74	66	84	161	150	144	104	46	48	59	65	78	107	113		
Nov.	68	60	87	137	138	134	77	42	47	57	64	76	105	106		
Dec.	65	60	89	131	141	137	67	43	50	54	67	80	111	106		
Av.	72	72	77	143	151	156	141	57	48	59	64	80	103	113		

TABLE 7

Price of Hay in Maine During the First and Second World Wars

Month	World War I								World War II					
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944
Jan.	\$14.00	\$13.85	\$15.40	\$12.15	\$11.60	\$15.85	\$21.10	\$24.25	\$8.40	\$8.20	\$ 9.30	\$14.60	\$12.70	\$13.40
Feb.	13.45	14.00	15.85	12.25	11.72	15.65	22.10	24.05	8.30	8.60	9.50	14.80	13.50	14.40
Mar.	13.05	14.00	15.70	12.50	11.88	15.50	25.80	22.80	8.40	8.30	10.40	15.00	13.40	14.90
Apr.	13.40	14.25	17.10	12.20	12.25	15.90	30.90	22.55	8.30	8.40	10.70	15.40	12.80	14.50
May	13.80	13.95	18.95	11.40	12.35	17.85	31.35	21.90	8.10	8.50	10.20	14.90	13.20	14.50
June	13.50	13.70	19.15	11.70	12.30	21.10	31.30	21.35	7.90	8.40	11.00	14.90	12.00	15.00
July	13.50	14.25	18.40	11.30	12.15	22.20	29.75	22.60	8.00	8.10	11.00	13.30	12.30	14.30
Aug.	13.65	15.30	15.80	9.95	12.25	22.15	26.30	24.05	7.70	8.20	11.00	13.00	11.90	14.30
Sept.	13.45	15.80	13.10	9.55	12.80	21.00	25.30	24.85	8.10	8.40	11.30	12.60	12.00	14.30
Oct.	13.10	15.75	13.10	10.20	13.10	19.60	26.20	23.70	7.90	8.10	11.60	14.00	12.70	16.00
Nov.	13.05	15.45	13.15	10.85	13.55	19.05	25.70	21.05	7.70	7.90	12.80	13.00	13.20	17.50
Dec.	13.40	14.95	12.10	11.30	14.65	19.25	24.05	20.50	8.50	8.90	14.00	13.50	13.40	18.00
Av.	\$13.45	\$14.60	\$15.65	\$11.28	\$12.55	\$18.76	\$26.65	\$22.80	\$8.11	\$8.33	\$11.07	\$14.08	\$12.76	\$15.09

Price of Hay in United States During the First and Second World Wars

Month	World War I								World War II					
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944
Jan.	\$11.68	\$10.65	\$10.31	\$11.10	\$18.48	\$19.86	\$21.16	\$15.70	\$6.79	\$7.90	\$7.78	\$10.19	\$11.20	\$15.70
Feb.	11.68	10.86	10.65	11.44	19.01	19.80	22.04	14.76	6.78	8.10	7.88	10.76	11.94	15.90
Mar.	11.60	10.94	10.80	12.04	18.91	20.17	22.62	13.94	6.67	8.22	7.93	11.03	12.28	16.00
Apr.	11.58	11.00	11.06	13.24	18.32	21.42	23.58	13.34	6.67	8.29	8.10	11.13	12.61	16.20
May	11.64	11.10	11.37	14.31	17.55	22.80	24.54	12.80	6.68	8.32	7.98	10.82	12.66	16.10
June	11.46	11.00	11.28	14.32	16.60	22.52	24.24	12.56	6.63	7.71	7.82	10.00	12.20	15.00
July	11.02	10.52	10.50	13.43	16.00	20.94	22.26	12.17	6.76	7.10	7.66	9.05	11.90	13.90
Aug.	10.93	10.07	9.80	13.08	16.67	20.34	20.38	11.72	6.77	7.10	7.64	8.89	12.20	14.30
Sept.	11.03	9.89	9.68	13.54	17.94	20.16	19.41	11.53	7.17	6.98	7.94	9.03	12.90	14.70
Oct.	10.87	9.90	9.82	14.50	18.86	19.58	18.20	11.24	7.31	6.99	8.34	9.39	13.70	15.20
Nov.	10.95	9.92	10.31	15.85	19.31	19.40	17.08	11.19	7.51	7.25	8.71	9.84	14.50	15.60
Dec.	10.80	9.97	10.74	17.32	19.64	20.00	16.43	11.29	7.71	7.53	9.43	10.46	15.20	16.50
Av.	\$11.27	\$10.49	\$10.53	\$13.68	\$18.11	\$20.58	\$21.00	\$12.69	\$6.95	\$7.62	\$8.10	\$10.05	\$12.77	\$15.42

TABLE 8

*Average Annual Prices Received by Farmers for Dry Beans,
Sweet Corn for Canning and Blueberries in Maine*

Year	Average annual prices received by Maine farmers for		
	Dry Beans ¹ (per cwt.)	Sweet corn for canning ² (per ton)	Blueberries ³ (per bushel)
1910	\$ 4.72	\$18.00*	\$
1911	4.15	17.00*	
1912	4.54	18.00*	
1913	4.75	18.00*	
1914	4.94	18.00*	
1915	6.06	18.00*	
1916	9.08	20.00*	
1917	14.15	28.00*	
1918	14.61	32.74	
1919	10.16	34.62	
1920	9.70	30.00	
1921	8.29	27.60	
1922	8.75	27.50	
1923	9.30	27.51	
1924	8.67	29.10	3.00
1925	8.05	29.76	3.37
1926	8.03	28.72	3.61
1927	8.02	22.30	3.16
1928	9.22	24.70	3.28
1929	9.12	24.70	3.50
1930	7.71	26.30	2.22
1931	5.95	19.30	1.10
1932	3.81	11.40	1.04
1933	4.29	12.80	1.99
1934	5.24	14.90	1.70
1935	5.39	16.50	1.56
1936	5.60	16.60	2.43
1937	6.74	16.40	2.67
1938	5.19	14.80	1.30
1939	4.75	14.30	1.46
1940	4.59	15.30	2.27
1941	5.37	15.50	3.05
1942	7.02	23.30	3.34
1943	7.89	28.00	5.41
1944	8.17	29.75	

* Estimated by author from miscellaneous unpublished sources.

¹ Income Parity for Agr.; Part 1, Farm Income; Section 18, Income from Dry Edible Beans, U.S.D.A., B.A.E., Mimeo., Oct. 1944.

² Commercial Truck Crops for Manufacture, U.S.D.A., B.A.E., Crop Reporting Board, Mimeo. reports for Oct. and Dec. 1934; Agricultural Statistics Yearbooks, U.S.D.A. for 1936, 1938, 1940, and 1941; 1943 Maine Crop and Livestock Review, Maine State Dept. of Agr., Augusta, Mimeo. 1944, p. 10.

³ 1943 Maine Crop and Livestock Review, Maine State Dept. of Agr., Augusta, Mimeo. 1944, p. 9.

TABLE 9

Price of Milk Cows in Maine During the First and Second World Wars

Month	World War I								World War II					
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944
Jan.	\$57.00	\$52.20	\$59.60	\$66.00	\$79.30	\$79.00	\$82.70	\$70.00	\$65.00	\$66.00	\$67.00	\$79.00	\$111.00	\$135.00
Feb.	53.80	57.90	58.30	65.40	81.40	80.00	82.50	64.00	64.00	65.00	68.00	77.00	120.00	135.00
Mar.	56.80	55.70	57.60	67.30	81.90	82.50	80.80	64.00	66.00	65.00	68.00	80.00	129.00	131.00
Apr.	56.40	56.10	60.80	70.00	82.60	86.50	83.50	62.00	64.00	64.00	69.00	83.00	129.00	127.00
May	57.00	58.70	62.30	70.60	85.00	89.00	82.10	62.00	63.00	66.00	67.00	85.00	140.00	124.00
June	56.30	57.60	60.90	73.20	85.40	87.20	81.30	60.00	63.00	66.00	70.00	84.00	146.00	124.00
July	52.00	57.60	62.00	74.00	86.10	87.80	79.50	57.00	63.00	67.00	70.00	86.00	141.00	118.00
Aug.	60.00	56.50	59.00	76.40	87.10	90.50	77.80	58.00	64.00	66.00	73.00	90.00	138.00	114.00
Sept.	60.00	59.00	60.00	73.90	83.00	86.70	80.00	53.00	64.00	67.00	73.00	90.00	136.00	105.00
Oct.	55.00	57.50	60.50	78.00	84.00	82.10	78.00	56.00	65.00	65.00	73.00	93.00	142.00	110.00
Nov.	55.00	54.70	62.50	80.90	79.00	79.40	72.00	54.00	66.00	67.00	78.00	97.00	140.00	110.00
Dec.	53.00	56.00	62.20	81.50	79.00	82.00	64.40	52.00	66.00	68.00	76.00	104.00	140.00	120.00
Av.	\$56.02	\$56.62	\$60.48	\$73.10	\$82.82	\$84.39	\$78.72	\$59.33	\$64.42	\$66.00	\$71.00	\$87.33	\$134.33	\$121.08

Price of Milk Cows in United States During the First and Second World Wars

Month	World War I								World War II					
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944
Jan.	\$57.99	\$58.47	\$57.79	\$63.92	\$76.54	\$86.10	\$94.42	\$66.82	\$58.60	\$59.90	\$64.60	\$81.70	\$103.10	\$108.00
Feb.	59.09	57.99	57.99	65.93	78.36	86.15	95.27	63.44	59.40	60.40	65.70	85.20	108.40	109.00
Mar.	59.23	58.00	59.51	68.46	80.71	88.15	94.94	65.37	59.60	60.40	66.00	86.00	114.30	111.00
Apr.	59.60	57.78	60.68	72.09	82.45	90.91	95.36	64.35	58.70	60.40	67.80	86.90	117.60	113.00
May	59.85	58.29	60.98	72.78	84.11	93.43	94.56	62.63	58.00	61.00	68.50	87.90	120.70	112.00
June	59.82	58.59	61.63	72.87	84.74	93.84	94.56	59.89	57.20	61.10	70.80	88.60	121.00	111.00
July	59.67	60.31	62.04	72.81	84.97	94.51	91.23	56.55	57.20	60.80	72.60	88.80	118.00	107.00
Aug.	60.72	58.34	61.32	72.53	84.06	94.72	90.50	55.85	56.50	60.30	73.50	90.60	117.00	105.00
Sept.	59.58	58.38	61.41	73.93	85.21	93.42	89.40	54.33	58.90	61.10	75.70	92.20	115.00	102.00
Oct.	59.53	58.76	62.19	75.79	85.41	93.43	85.90	53.39	59.40	61.50	77.20	93.40	114.00	102.00
Nov.	58.77	57.35	62.67	75.00	84.51	93.27	77.56	53.28	59.20	62.40	77.90	95.70	112.00	102.00
Dec.	58.23	56.79	63.18	76.16	85.78	95.54	70.42	53.30	59.90	63.10	79.70	99.20	109.00	103.00
Av.	\$59.34	\$58.25	\$60.95	\$71.86	\$83.07	\$91.96	\$89.51	\$59.10	\$58.55	\$61.03	\$71.67	\$89.68	\$114.18	\$107.08

TABLE 10

Price of Milk in Maine During the First and Second World Wars

Month	World War I								World War II							
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945	1946
	(cents per cwt.)								(cents per cwt.)							
Jan.	205	210	215	260	360	400	375	330	225	225	225	285	320	370		
Feb.	195	200	210	255	360	385	370	280	215	225	215	280	325	365		
Mar.	185	185	205	250	350	355	365	270	200	215	210	270	330	355		
Apr.	170	170	190	245	325	335	350	265	175	205	210	260	325	345		
May	165	155	185	240	305	310	330	245	160	185	205	250	320	330		
June	160	150	175	235	295	300	320	250	155	175	210	235	320	325		
July	175	170	190	245	325	335*	350	280	185	185	230	255	335	340		
Aug.	185	180	200	295	340	345	375	310	200	215	250	275	345	360		
Sept.	195	190	205	300	350	355	375	315	205	215	260	295	355	355		
Oct.	210	200	245	310	385	365	375	315	225	220	275	315	360	365		
Nov.	215	220	255	315	415	385	390	305	235	230	290	320	375	375		
Dec.	215	225	275	320	415	385	355	285	230	230	290	330	375	375		
Av.	190	188	212	272	352	355	361	288	201	210	239	281	340	355		

Price of Milk in United States During the First and Second World Wars

Month	World War I								World War II							
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945	1946
	(cents per cwt.)								(cents per cwt.)							
Jan.	188	183	185	220	327	370	368	287	182	196	200	263	302	335		
Feb.	179	177	181	219	319	341	351	262	174	193	191	259	306	333		
Mar.	168	166	172	212	303	323	330	247	160	185	189	250	304	327		
Apr.	150	152	160	215	266	302	306	234	149	175	191	238	302	321		
May	133	135	146	207	246	294	295	205	139	165	194	234	301	314		
June	129	131	139	199	225	292	292	185	142	161	197	232	302	310		
July	140	138	148	216	250	310	308	201	150	167	213	240	305	315		
Aug.	152	147	162	242	281	331	329	225	161	175	225	252	313	322		
Sept.	160	157	176	258	309	339	339	228	176	182	237	262	321	326		
Oct.	177	172	206	297	348	350	335	242	186	191	252	276	328	334		
Nov.	187	186	218	307	377	366	327	242	199	199	264	289	337	339		
Dec.	188	190	223	317	392	377	302	238	199	207	266	301	340	339		
Av.	163	161	176	242	304	333	324	233	168	183	218	258	313	326		

TABLE 11

Price of Butter in Maine During the First and Second World Wars

Month	World War I								World War II							
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945	1946
	(cents per pound)								(cents per pound)							
Jan.	32	31	32	38	46	58	68	56	31	32	34	39	50	51		
Feb.	32	30	31	38	46	54	68	54	31	32	34	39	52	51		
Mar.	32	30	32	39	47	52	66	52	30	32	34	39	55	49		
Apr.	30	30	32	39	46	52	64	51	29	32	34	39	54	49		
May	30	30	32	40	46	52	62	46	28	31	34	40	52	49		
June	28	30	32	40	46	52	58	40	28	31	35	39	50	49		
July	29	30	32	38	46	52	60	39	28	30	35	39	49	49		
Aug.	30	30	32	40	48	56	62	45	29	31	37	41	48	49		
Sept.	31	30	32	44	49	60	63	49	31	31	37	42	49	50		
Oct.	32	31	34	47	52	60	66	50	31	32	38	45	50	50		
Nov.	32	32	36	47	55	63	66	50	32	33	39	47	50	51		
Dec.	32	32	37	48	56	66	60	49	32	34	38	48	51	50		
Av.	31	30	33	42	49	56	64	48	30	32	36	41	51	50		

Price of Butter in United States During the First and Second World Wars

Month	World War I								World War II							
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945	1946
	(cents per pound)								(cents per pound)							
Jan.	28	28	28	34	43	52	60	47	26	28	29	34	43	45		
Feb.	27	27	27	34	44	47	57	44	26	28	28	34	44	44		
Mar.	25	26	27	34	42	46	56	41	25	27	28	33	44	44		
Apr.	24	26	28	35	40	49	57	40	24	26	29	34	45	44		
May	23	25	27	36	39	50	56	34	24	26	30	34	45	44		
June	23	24	26	34	38	48	53	29	24	26	31	34	44	44		
July	23	24	26	34	39	48	52	32	24	26	31	34	43	44		
Aug.	24	24	27	35	41	49	52	35	24	26	31	36	44	44		
Sept.	26	25	28	38	44	51	53	37	26	27	33	37	44	44		
Oct.	26	26	30	40	48	54	54	40	27	27	33	40	45	45		
Nov.	27	27	33	41	51	58	54	41	27	28	34	41	45	45		
Dec.	29	28	34	42	54	61	52	41	27	30	34	42	45	46		
Av.	25	26	28	36	44	51	55	38	25	27	31	36	44	44		

TABLE 12

Price of Veal Calves in Maine During the First and Second World Wars

Month	World War I								World War II					
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944
Jan.	\$8.90	\$8.70	\$8.10	\$9.80	\$12.50	\$13.80	\$14.40	\$11.60	\$8.90	\$8.80	\$9.50	\$10.20	\$13.00	\$11.40
Feb.	8.70	8.50	8.60	10.90	13.60	13.90	14.40	11.90	8.30	8.40	8.90	10.40	13.40	11.90
Mar.	8.70	8.70	9.00	10.80	13.10	14.40	14.30	11.60	8.60	8.40	8.90	10.50	13.40	11.80
Apr.	7.80	8.40	8.90	11.30	13.50	14.50	14.00	10.50	8.30	8.40	9.00	10.70	13.40	12.00
May	7.80	8.00	8.60	11.50	12.90	13.20	13.00	9.60	8.30	8.60	9.10	10.80	14.00	12.20
June	8.10	8.50	9.20	11.50	13.70	13.50	13.00	10.00	8.50	8.40	9.10	11.50	14.10	11.80
July	8.30	8.50	9.30	11.80	13.10	13.80	13.00	9.40	8.80	8.50	9.40	12.00	14.10	11.90
Aug.	9.50	8.60	9.00	12.70	13.60	14.80	13.60	9.80	8.30	8.30	10.00	12.30	13.80	11.90
Sept.	8.80	8.40	9.50	12.30	14.30	14.70	14.00	9.70	9.10	8.60	9.40	12.00	13.50	11.90
Oct.	8.70	8.30	9.50	12.10	13.70	14.80	13.20	9.70	9.30	8.60	9.80	12.90	12.60	11.60
Nov.	8.70	8.20	9.50	12.40	13.70	14.30	12.60	9.80	9.30	8.80	9.70	12.60	12.40	11.70
Dec.	8.60	8.60	9.60	12.70	14.10	14.20	12.00	9.40	9.00	8.70	9.80	12.10	11.50	11.90
Av.	\$8.55	\$8.45	\$9.07	\$11.65	\$13.48	\$14.16	\$13.46	\$10.25	\$8.72	\$8.54	\$9.38	\$11.50	\$13.27	\$11.83

Price of Veal Calves in United States During the First and Second World Wars

Month	World War I								World War II					
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944
Jan.	\$7.89	\$7.66	\$7.67	\$ 9.15	\$11.16	\$12.39	\$12.89	\$9.34	\$8.30	\$8.95	\$ 9.70	\$12.14	\$13.60	\$12.70
Feb.	7.90	7.62	7.87	9.88	11.17	12.18	13.12	9.08	8.73	8.80	10.11	12.05	14.18	13.10
Mar.	7.92	7.50	8.11	9.94	11.33	12.65	12.98	9.05	8.69	8.81	9.74	12.23	14.45	13.30
Apr.	7.68	7.31	8.00	10.49	11.71	12.78	12.72	7.73	8.38	8.63	9.84	12.22	14.25	13.20
May	7.59	7.35	8.08	10.48	11.62	12.11	11.69	7.55	8.26	8.91	9.90	12.45	14.30	13.30
June	7.69	7.53	8.39	10.60	11.88	12.40	11.68	7.43	7.98	8.46	9.90	12.43	14.20	13.20
July	7.80	7.87	8.54	10.77	12.33	13.38	11.44	7.37	8.11	8.56	10.27	12.56	13.90	13.00
Aug.	8.08	7.75	8.59	10.56	12.22	13.43	11.64	7.31	8.13	8.59	10.56	12.91	13.70	12.90
Sept.	8.06	7.80	8.77	11.08	12.57	13.39	11.88	7.67	8.92	9.06	11.26	13.00	13.50	12.90
Oct.	7.97	7.91	8.59	11.10	12.35	12.87	11.64	7.61	8.88	9.11	11.14	13.02	13.20	12.90
Nov.	7.78	7.69	8.60	10.66	11.94	12.65	10.77	7.20	8.64	9.06	10.79	13.02	12.70	12.90
Dec.	7.61	7.61	8.79	10.98	12.31	12.67	9.27	7.14	8.41	9.01	11.22	13.14	12.70	12.90
Av.	\$7.83	\$7.63	\$8.33	\$10.47	\$11.88	\$12.74	\$11.81	\$7.87	\$8.45	\$8.83	\$10.37	\$12.60	\$13.72	\$13.02

TABLE 13

Price of Beef Cattle in Maine During the First and Second World Wars

Month	World War I								World War II					
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944
Jan.	\$6.90	\$6.90	\$6.50	\$ 7.70	\$ 9.60	\$11.50	\$10.30	\$7.80	\$5.30	\$5.50	\$5.90	\$6.90	\$10.60	\$9.70
Feb.	6.80	6.90	6.60	8.40	10.60	10.60	10.10	8.40	5.30	5.30	5.90	7.40	11.00	9.40
Mar.	7.50	7.00	7.00	8.70	10.50	11.80	9.70	7.90	5.60	5.50	6.00	7.80	11.10	9.20
Apr.	7.00	6.80	7.30	9.60	10.10	11.80	10.50	7.60	5.60	5.70	6.40	7.80	11.50	9.20
May	6.90	6.70	7.50	9.50	11.70	11.90	9.60	8.30	5.50	5.70	6.00	8.10	11.00	8.80
June	7.50	7.10	8.00	9.60	12.90	11.70	10.20	8.00	5.60	6.00	6.70	8.60	11.40	9.10
July	7.50	7.10	8.10	9.60	11.00	11.10	10.20	7.20	5.70	6.00	6.60	9.20	11.70	9.80
Aug.	7.50	7.50	7.60	9.50	11.80	11.10	10.30	7.20	5.30	5.80	6.60	9.60	11.30	8.80
Sept.	8.10	6.90	8.00	10.30	12.60	9.50	10.50	7.00	5.70	5.50	6.70	9.30	11.30	8.20
Oct.	7.40	6.80	7.60	9.70	10.90	9.60	9.70	6.90	5.70	5.50	6.90	9.80	10.20	8.70
Nov.	7.50	6.60	7.40	9.30	11.30	9.70	8.40	6.70	5.40	5.60	6.20	10.00	9.60	8.10
Dec.	7.00	6.70	7.60	10.30	11.50	10.30	7.40	6.50	5.40	5.60	6.30	10.20	10.00	8.40
Av.	\$7.30	\$6.92	\$7.43	\$ 9.35	\$11.21	\$10.88	\$ 9.74	\$7.46	\$5.51	\$5.64	\$6.35	\$8.72	\$10.89	\$8.95

Price of Beef Cattle in United States During the First and Second World Wars

Month	World War I								World War II					
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944
Jan.	\$6.04	\$5.99	\$5.85	\$6.86	\$ 8.33	\$ 9.65	\$8.99	\$6.32	\$6.68	\$6.94	\$8.09	\$ 9.77	\$11.78	\$11.40
Feb.	6.16	5.93	5.99	7.36	8.55	10.02	8.98	6.02	6.86	6.84	8.34	9.93	12.36	11.80
Mar.	6.28	5.92	6.37	7.91	8.85	10.34	9.08	6.36	7.00	7.00	8.28	10.26	12.80	12.00
Apr.	6.29	5.96	6.66	8.57	9.73	10.81	9.20	6.08	7.08	7.16	8.60	10.71	13.03	12.10
May	6.33	6.13	6.73	8.70	10.38	10.84	8.97	5.98	7.09	7.35	8.52	10.65	12.91	12.10
June	6.32	6.20	6.91	8.65	10.40	10.20	9.32	5.65	6.81	7.10	8.63	10.75	12.80	12.00
July	6.38	6.07	6.78	8.30	10.07	9.96	8.93	5.40	6.66	7.26	8.78	10.79	12.60	11.70
Aug.	6.47	6.18	6.51	8.17	9.71	9.82	8.56	5.39	6.50	7.21	9.07	11.30	12.30	11.70
Sept.	6.38	6.06	6.55	8.40	9.63	9.02	8.29	4.98	7.07	7.49	9.36	11.17	12.10	11.60
Oct.	6.23	6.04	6.37	8.35	9.33	8.65	7.77	4.81	6.97	7.50	9.18	11.36	11.80	11.60
Nov.	6.02	5.85	6.44	8.21	9.14	8.65	7.15	4.69	6.89	7.58	8.85	11.39	11.30	11.60
Dec.	6.01	5.75	6.56	8.24	9.28	8.63	6.36	4.62	6.85	7.56	9.38	11.43	11.40	11.50
Av.	\$6.24	\$6.01	\$6.48	\$8.14	\$ 9.45	\$ 9.72	\$8.47	\$5.52	\$6.87	\$7.25	\$8.76	\$10.79	\$12.26	\$11.70

TABLE 14

Price of Chickens in Maine During the First and Second World Wars

Month	World War I								World War II							
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945	1946
	(cents per pound)								(cents per pound)							
Jan.	13	14	14	16	20	28	28	26	18	14	16	19	23	25		
Feb.	14	13	14	17	22	27	28	29	17	15	16	19	25	25		
Mar.	15	14	15	18	23	27	30	29	17	15	16	20	26	25		
Apr.	16	15	16	20	22	29	30	29	16	15	17	20	26	26		
May	15	14	16	20	26	32	31	29	16	17	18	20	26	26		
June	15	16	16	20	25	30	32	29	15	16	18	20	26	26		
July	16	16	16	21	26	32	33	30	16	16	18	20	26	26		
Aug.	16	15	16	18	27	33	34	29	16	15	17	21	25	27		
Sept.	15	14	16	20	29	30	31	27	15	16	18	21	26	27		
Oct.	15	13	17	19	27	29	31	28	15	15	17	21	26	26		
Nov.	14	14	15	19	28	27	29	24	15	15	18	22	25	26		
Dec.	13	14	16	20	28	28	27	24	15	15	18	22	26	27		
Av.	15	14	16	19	25	29	30	28	16	15	17	20	26	26		

Price of Chickens in United States During the First and Second World Wars

Month	World War I								World War II							
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945	1946
	(cents per pound)								(cents per pound)							
Jan.	12	11	12	14	18	22	23	22	14	12	14	17	22	24		
Feb.	12	11	12	15	20	22	26	22	14	12	14	17	23	24		
Mar.	12	12	12	16	20	23	27	23	14	13	14	18	24	24		
Apr.	13	12	13	17	21	26	28	22	14	13	16	18	25	24		
May	13	12	14	18	21	27	28	22	14	14	16	18	25	24		
June	13	12	14	18	21	26	27	22	13	13	16	18	25	24		
July	13	12	14	17	23	27	28	22	14	14	17	19	25	24		
Aug.	13	12	14	17	23	26	27	21	13	13	16	20	26	24		
Sept.	13	12	14	18	24	25	27	20	14	14	16	20	25	24		
Oct.	12	12	14	18	22	23	25	19	13	13	16	20	25	24		
Nov.	11	12	14	17	22	22	23	19	12	13	16	20	24	24		
Dec.	11	11	14	18	22	22	21	18	12	13	16	20	24	24		
Av.	12	12	13	17	21	24	26	21	13	13	16	19	24	24		

TABLE 15

Price of Eggs in Maine During the First and Second World Wars

Month	World War I								World War II							
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945	1946
	(cents per dozen)								(cents per dozen)							
Jan.	34	36	33	43	60	69	72	66	26	23	26	36	46	40		
Feb.	32	29	29	40	57	48	62	54	25	27	24	34	40	36		
Mar.	30	22	25	32	40	45	56	38	24	23	24	32	40	34		
Apr.	20	20	21	31	39	42	49	31	22	21	25	30	39	32		
May	21	22	22	36	38	45	48	31	22	22	26	32	40	32		
June	21	22	25	36	40	50	50	33	23	22	30	33	42	32		
July	24	23	27	35	44	55	55	38	29	29	36	39	45	41		
Aug.	27	27	31	42	49	60	61	45	32	31	40	45	47	46		
Sept.	29	30	38	48	53	61	65	49	33	33	41	45	50	49		
Oct.	33	35	40	50	57	65	71	56	32	34	40	47	54	49		
Nov.	40	42	46	54	66	76	85	68	34	35	43	49	55	52		
Dec.	44	41	49	60	73	78	84	71	27	31	38	48	52	54		
Av.	30	29	32	42	51	58	63	48	27	28	33	39	46	41		

Price of Eggs in United States During the First and Second World Wars

Month	World War I								World War II							
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945	1946
	(cents per dozen)								(cents per dozen)							
Jan.	30	32	29	38	49	55	61	54	19	18	20	31	39	35		
Feb.	25	24	24	36	46	35	48	31	17	20	17	28	34	32		
Mar.	22	16	18	25	31	34	40	27	16	15	16	26	34	30		
Apr.	16	17	18	28	30	36	37	20	16	15	20	26	34	27		
May	17	16	18	30	31	39	38	19	15	15	20	26	34	27		
June	17	16	19	30	30	36	36	20	15	14	23	27	35	28		
July	18	16	20	29	33	38	38	24	16	16	26	30	36	31		
Aug.	19	17	22	30	35	41	42	29	18	17	27	32	39	33		
Sept.	22	21	25	36	39	43	49	31	21	21	30	35	42	36		
Oct.	24	25	30	38	45	51	55	39	23	24	32	37	45	39		
Nov.	28	29	35	41	52	59	63	50	26	26	36	39	47	43		
Dec.	32	31	38	46	59	70	67	51	20	27	34	40	45	44		
Av.	22	22	25	34	40	45	48	33	18	19	25	31	39	34		

TABLE 16

Price of Sheep in Maine During the First and Second World Wars

Month	World War I								World War II					
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944
Jan.	\$4.00	\$5.50	\$4.80	\$7.00	\$ 8.00	\$ 9.30	\$8.40	\$5.60	\$4.30	\$4.50	\$4.80	\$4.70	\$6.50	\$6.20
Feb.	4.40	5.10	5.10	7.20	9.80	10.00	8.20	5.70	4.30	4.30	4.60	4.80	7.00	6.10
Mar.	4.80	5.20	5.80	8.30	10.70	9.90	8.30	6.10	4.40	4.30	4.70	5.60	7.30	6.60
Apr.	4.50	5.00	5.50	8.50	8.50	10.40	8.70	6.50	4.70	4.30	4.70	5.20	6.80	6.40
May	5.00	5.60	6.10	9.20	11.60	10.00	9.20	8.00	4.70	4.20	4.60	5.30	7.10	5.80
June	5.00	5.50	6.30	8.50	10.00	9.80	8.90	7.00	4.70	4.20	4.60	6.10	6.80	6.20
July	4.00	5.40	6.00	8.70	10.80	8.50	8.70	5.70	4.90	4.20	4.70	6.40	7.00	6.40
Aug.	5.10	5.60	6.00	8.60	10.50	10.30	7.70	5.80	4.70	4.30	4.70	6.20	7.00	6.50
Sept.	4.80	5.40	6.00	9.10	10.70	9.00	8.10	5.30	4.70	4.50	4.40	5.60	6.50	6.80
Oct.	4.20	4.90	6.10	7.90	10.40	7.30	6.50	5.00	4.50	4.30	4.20	6.20	6.00	6.20
Nov.	4.60	5.10	6.10	8.50	9.20	7.70	6.20	4.50	4.70	4.30	4.05	6.50	6.50	6.20
Dec.	5.40	4.90	6.00	8.90	10.50	8.30	6.50	5.00	4.20	4.20	4.50	6.50	6.20	6.20
Year	\$4.65	\$5.27	\$5.82	\$8.37	\$10.06	\$ 9.21	\$7.95	\$5.85	\$4.57	\$4.30	\$4.55	\$5.76	\$6.72	\$6.30

Price of Sheep in United States During the First and Second World Wars

Month	World War I								World War II					
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944
Jan.	\$4.67	\$4.95	\$5.52	\$ 7.33	\$10.55	\$ 9.68	\$ 9.34	\$5.30	\$3.83	\$3.86	\$4.35	\$5.43	\$6.45	\$6.11
Feb.	4.67	5.14	5.90	8.17	10.75	9.95	9.97	5.01	4.02	3.93	4.58	5.62	7.09	6.57
Mar.	4.77	5.36	6.35	9.21	11.41	10.45	10.25	5.27	3.99	4.25	4.78	5.83	7.27	6.79
Apr.	4.96	5.60	6.61	9.69	11.98	11.33	10.66	5.11	4.19	4.15	5.11	6.12	7.35	6.97
May	4.87	5.54	6.66	10.15	12.32	10.93	10.34	5.11	3.94	4.02	4.90	6.10	7.31	6.75
June	4.70	5.43	6.54	9.84	11.56	10.34	9.13	4.74	3.67	3.81	4.62	5.65	7.07	6.60
July	4.75	5.35	6.33	9.32	11.04	9.25	8.21	4.84	3.66	3.60	4.60	5.53	6.77	6.10
Aug.	4.87	5.16	6.22	9.33	10.99	9.06	7.54	4.38	3.59	3.60	4.93	5.62	6.41	5.77
Sept.	4.80	5.06	6.25	10.05	10.79	8.69	7.24	4.11	3.80	3.68	5.25	5.55	6.29	5.52
Oct.	4.81	5.18	6.20	10.24	10.35	8.46	6.62	3.96	3.92	3.72	5.04	5.50	5.97	5.61
Nov.	4.68	5.18	6.41	10.20	10.11	8.35	6.20	3.84	3.83	3.88	5.04	5.55	5.70	5.62
Dec.	4.95	5.38	6.77	10.44	9.46	8.53	5.54	4.10	3.79	3.99	5.15	5.98	5.84	5.82
Year	\$4.79	\$5.28	\$6.31	\$ 9.50	\$10.94	\$ 9.58	\$ 8.42	\$4.61	\$3.85	\$3.87	\$4.86	\$5.71	\$6.63	\$6.19

TABLE 17

Price of Lambs in Maine During the First and Second World Wars

Month	World War I								World War II						
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945
Jan.	\$6.00	\$6.70	\$ 6.90	\$ 9.00	\$11.60	\$12.30	\$11.80	\$ 9.60	\$9.00	\$7.60	\$8.70	\$ 9.70	\$12.40	\$12.80	\$12.80
Feb.	6.20	6.10	7.00	9.80	12.70	13.10	12.80	9.70	8.20	7.40	8.70	9.90	12.80	12.80	12.80
Mar.	6.60	6.70	7.80	10.50	13.90	13.80	12.80	11.30	8.80	7.80	8.90	10.20	13.00	12.80	12.80
Apr.	6.40	7.10	8.30	11.70	11.80	13.60	13.40	9.90	8.10	8.40	9.20	10.20	13.10	12.80	12.80
May	7.00	8.00	9.40	12.00	15.40	13.40	14.25	11.50	8.60	8.50	9.20	10.20	14.50	12.80	12.80
June	8.00	9.00	9.60	12.20	16.10	14.00	14.00	12.00	8.60	8.50	9.40	11.30	14.00	12.80	12.80
July	6.60	8.50	10.00	12.50	13.70	14.00	14.60	10.00	8.80	8.50	9.70	11.40	14.80	12.80	12.80
Aug.	7.50	9.00	8.90	12.40	14.00	14.20	14.20	12.70	8.10	8.50	9.70	11.40	14.40	12.80	12.80
Sept.	7.00	7.70	9.50	12.60	14.30	12.10	11.80	9.20	8.30	8.50	9.50	11.00	13.80	11.80	11.80
Oct.	6.40	7.20	8.70	11.30	13.80	11.70	11.40	8.50	8.40	7.80	9.20	11.10	13.00	11.80	11.80
Nov.	6.40	6.70	9.00	11.10	11.70	11.50	10.00	8.00	8.10	8.30	9.20	11.40	13.50	12.80	12.80
Dec.	6.80	7.00	8.90	12.00	12.50	12.20	10.70	8.00	7.90	8.00	9.20	12.40	12.80	11.80	11.80
Av.	\$6.74	\$7.48	\$ 8.67	\$11.42	\$13.46	\$12.99	\$12.65	\$10.03	\$8.41	\$8.15	\$9.22	\$10.85	\$13.51	\$12.80	\$12.80

Price of Lambs in United States During the First and Second World Wars

Month	World War I								World War II						
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945
Jan.	\$6.16	\$6.47	\$7.29	\$ 9.59	\$13.83	\$12.71	\$12.91	\$8.44	\$7.33	\$7.57	\$8.34	\$10.30	\$13.04	\$12.80	\$12.80
Feb.	6.18	6.67	7.78	10.51	13.77	13.17	14.08	7.76	7.37	7.61	8.60	10.48	13.77	12.80	12.80
Mar.	6.31	6.06	8.10	11.46	14.11	14.03	14.17	7.90	7.43	8.05	8.92	10.36	13.98	12.80	12.80
Apr.	6.47	7.35	8.58	12.03	15.34	14.61	14.63	7.55	7.88	8.14	9.09	10.83	13.88	12.80	12.80
May	6.49	7.32	8.49	12.51	15.39	14.34	14.26	7.78	8.02	8.25	9.05	11.62	13.83	12.80	12.80
June	6.47	7.26	8.36	12.64	14.98	13.89	12.82	7.59	7.49	8.12	9.14	11.99	13.50	12.80	12.80
July	6.55	7.21	8.16	11.19	14.20	13.09	11.79	7.37	7.31	7.85	9.13	11.82	13.30	12.80	12.80
Aug.	6.26	6.70	8.15	12.08	14.20	12.91	10.84	6.99	6.94	7.52	9.33	12.07	12.80	12.80	12.80
Sept.	6.27	6.71	8.22	13.06	13.73	12.25	10.31	6.27	7.57	7.59	9.84	11.92	12.50	12.80	12.80
Oct.	6.09	6.70	8.02	14.09	13.20	11.47	9.65	5.98	7.60	7.64	9.66	11.84	12.20	12.80	12.80
Nov.	6.14	6.76	8.41	13.79	12.54	11.45	9.37	6.12	7.48	7.78	9.48	12.05	11.90	12.80	12.80
Dec.	6.33	7.02	8.72	13.81	12.44	11.85	8.46	6.60	7.38	7.88	9.86	12.51	12.10	12.80	12.80
Av.	\$6.31	\$6.85	\$8.19	\$12.23	\$13.98	\$12.98	\$11.94	\$7.20	\$7.48	\$7.83	\$9.20	\$11.48	\$13.07	\$12.80	\$12.80

TABLE 18

Price of Wool in Maine During the First and Second World Wars

Month	World War I								World War II							
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945	1946
	(cents per pound)								(cents per pound)							
Jan.	21	24	31	38	70	66	56	22	24	33	34	39	42	45		
Feb.	20	23	32	39	70	63	57	23	24	32	35	41	44	43		
Mar.	20	24	32	39	69	60	58	20	23	33	35	40	44	43		
Apr.	19	24	33	42	71	65	54	21	22	33	36	42	41	43		
May	19	29	34	46	69	56	50	19	22	31	37	44	43	44		
June	21	29	35	49	68	51	39	18	22	30	37	44	41	44		
July	23	30	36	59	69	57	32	18	24	33	37	44	42	44		
Aug.	23	30	37	62	71	59	23	18	26	32	39	43	44	43		
Sept.	23	30	37	64	69	59	27	18	26	34	40	41	44	44		
Oct.	23	31	37	66	70	59	26	18	32	34	42	42	44	43		
Nov.	24	30	38	66	70	58	24	19	33	35	41	40	46	45		
Dec.	23	30	40	68	70	59	22	19	32	32	41	41	45	45		
Av.	22	28	35	53	70	59	39	19	26	33	38	42	43	44		

Price of Wool in United States During the First and Second World Wars

Month	World War I								World War II							
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945	1946
	(cents per pound)								(cents per pound)							
Jan.	16	19	23	32	58	55	53	20	20	28	31	37	40	40		
Feb.	16	20	24	33	57	51	52	20	20	28	32	37	40	40		
Mar.	16	23	26	37	60	51	52	19	20	27	33	38	40	39		
Apr.	17	23	26	39	60	48	51	18	20	26	35	39	41	40		
May	17	22	28	44	58	48	50	16	21	28	36	40	41	41		
June	18	24	29	50	57	50	39	15	22	29	36	40	41	42		
July	18	24	29	54	58	52	30	16	22	28	36	39	42	43		
Aug.	19	24	29	55	57	52	28	15	22	27	36	39	41	42		
Sept.	19	23	28	54	58	51	28	16	24	28	36	40	41	41		
Oct.	18	23	29	56	58	51	28	16	29	30	36	40	41	40		
Nov.	18	23	29	56	56	51	25	16	28	32	37	40	41	40		
Dec.	19	23	31	58	56	52	22	17	28	31	37	40	40	40		
Av.	18	23	28	47	54	51	38	17	23	28	35	39	41	41		

TABLE 19

Price of Hogs in Maine During the First and Second World Wars

Month	World War I								World War II					
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944
Jan.	\$7.50	\$7.80	\$6.80	\$ 9.20	\$15.00	\$16.00	\$14.50	\$10.20	\$8.10	\$6.40	\$6.70	\$10.00	\$13.90	\$12.30
Feb.	8.00	7.30	7.30	10.60	16.20	15.50	14.60	10.10	8.00	6.20	6.80	10.50	14.40	11.90
Mar.	8.20	7.20	8.00	12.30	16.10	16.20	14.20	10.30	8.20	6.20	6.70	11.00	14.80	12.30
Apr.	7.90	7.20	8.40	13.80	16.10	17.00	14.40	10.10	7.70	6.40	8.00	12.00	14.80	12.00
May	7.80	7.10	8.50	14.20	16.30	18.00	13.60	9.50	7.60	6.20	8.00	11.60	14.80	11.80
June	7.70	7.40	8.70	14.00	16.20	17.30	13.40	8.70	7.40	6.00	8.70	12.10	14.60	11.50
July	7.50	7.30	8.50	13.80	15.20	17.90	14.10	9.00	7.70	6.20	8.70	12.20	13.70	12.00
Aug.	8.10	7.40	8.80	14.30	16.90	19.00	14.10	9.90	7.00	6.20	9.20	12.60	13.40	11.80
Sept.	8.50	6.90	9.30	15.80	17.70	15.80	14.50	9.00	7.90	6.50	9.40	12.40	12.90	12.10
Oct.	8.20	7.30	9.30	16.30	16.70	14.90	15.30	8.80	7.70	6.40	9.40	12.60	12.30	12.50
Nov.	8.30	7.30	9.20	15.40	16.30	14.10	12.80	8.30	7.30	6.30	9.60	12.90	12.80	12.30
Dec.	7.50	6.90	9.20	15.90	16.30	14.80	10.10	7.80	6.90	6.50	9.60	13.00	12.30	12.40
Av.	\$7.93	\$7.26	\$8.50	\$13.80	\$16.29	\$16.38	\$13.80	\$ 9.31	\$7.62	\$6.29	\$8.40	\$11.91	\$13.72	\$12.08

Price of Hogs in United States During the First and Second World Wars

Month	World War I								World War II					
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944
Jan.	\$7.45	\$6.57	\$6.32	\$ 9.16	\$15.26	\$15.69	\$13.36	\$8.72	\$6.96	\$5.18	\$ 7.26	\$10.55	\$14.07	\$12.88
Feb.	7.75	6.34	7.07	10.33	15.03	15.53	13.62	8.58	7.21	4.97	7.19	11.64	14.63	12.98
Mar.	7.80	6.33	7.86	12.32	15.58	16.13	13.59	9.13	7.10	4.87	7.08	12.34	14.67	13.11
Apr.	7.80	6.48	8.21	13.61	15.76	17.39	13.73	7.96	6.57	4.90	8.01	13.48	14.35	13.00
May	7.60	6.77	8.37	13.72	15.84	18.00	13.44	7.62	6.39	5.35	8.19	13.28	13.90	12.78
June	7.43	6.80	8.21	13.50	15.37	17.80	13.18	7.22	5.96	4.82	8.98	13.39	13.60	12.60
July	7.72	6.84	8.40	13.35	15.58	19.22	13.65	8.09	6.26	5.78	10.20	13.78	13.20	12.78
Aug.	8.11	6.61	8.61	14.24	16.89	19.30	13.59	8.73	5.47	5.83	10.39	14.13	13.70	13.58
Sept.	8.11	6.79	9.22	15.69	17.50	15.81	13.98	7.51	7.06	6.14	11.10	13.57	14.10	13.60
Oct.	7.43	7.18	8.67	16.15	16.50	13.88	13.57	7.31	6.52	5.83	10.08	14.11	14.00	13.80
Nov.	7.00	6.35	8.74	15.31	15.92	13.36	11.64	6.66	5.87	5.62	9.66	13.44	12.90	13.80
Dec.	6.67	6.02	8.76	15.73	15.82	12.66	8.90	6.52	5.03	5.59	10.21	13.27	12.80	13.80
Av.	\$7.57	\$6.59	\$8.20	\$13.59	\$15.92	\$16.23	\$13.02	\$7.84	\$6.37	\$5.41	\$ 9.03	\$13.08	\$13.83	\$13.80

TABLE 20

Price of Horses in Maine During the First and Second World Wars

Month	World War I								World War II							
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945	1946
	(dollars per head)								(dollars per head)							
Jan.	220	193	183	186	200	184	199	174	162	147	143	155	167	160		
Feb.	228	210	187	188	200	195	183	159	155	152	141	150	171	162		
Mar.	214	202	187	190	212	190	183	168	160	150	145	165	171	167		
Apr.	215	207	196	222	209	193	220	177	165	151	150	165	173	175		
May	225	193	199	211	212	190	200	157	160	145	145	162	179	170		
June	220	200	192	227	192	183	203	153	160	150	150	165	184	168		
July	209	194	200	206	190	174	175	165	165	155	160	160	175	169		
Aug.	200	186	194	209	199	185	182	174	162	158	155	159	177	164		
Sept.	205	195	183	211	190	185	192	165	162	157	150	164	170	155		
Oct.	195	200	190	195	199	170	185	160	156	157	154	167	160	160		
Nov.	198	180	175	192	180	182	180	146	158	153	145	162	155	165		
Dec.	200	195	188	203	192	197	169	150	153	148	155	162	160	155		
Av.	211	196	190	203	198	186	189	162	160	152	149	161	170	164		

Price of Horses in United States During the First and Second World Wars

Month	World War I								World War II							
	1914	1915	1916	1917	1918	1919	1920	1921	1939	1940	1941	1942	1943	1944	1945	1946
	(dollars per head)								(dollars per head)							
Jan.	137	130	128	129	130	120	118	96	82	78	70	72	82	80		
Feb.	139	132	129	131	133	121	123	98	83	78	70	78	84	82		
Mar.	138	132	131	133	137	124	127	101	83	78	70	80	88	81		
Apr.	138	132	133	136	137	127	131	100	82	77	70	80	90	81		
May	139	133	134	138	136	129	132	98	82	76	70	79	90	80		
June	136	132	132	137	135	127	130	98	81	75	70	79	90	80		
July	137	134	133	135	132	127	127	94	80	74	70	79	88	77		
Aug.	135	131	131	132	131	125	124	93	78	72	69	79	86	76		
Sept.	132	131	131	132	128	119	119	89	80	73	68	79	86	74		
Oct.	131	129	130	130	126	114	112	85	79	71	67	79	84	72		
Nov.	130	127	129	129	122	113	103	82	78	70	67	79	81	70		
Dec.	130	126	129	129	121	113	97	81	77	69	67	80	79	67		
Av.	135	131	131	133	131	122	120	93	80	74	69	79	86	77		

APPENDIX C—Statistical Tables on Purchasing Power of Livestock in Maine

TABLE 1

Farm Value¹ and Purchasing Power of Dairy Cows in Maine

Index Numbers (1910 to 1914 = 100)

Year	Farm Value		Index of wholesale prices of all commodities January 1	Purchasing power of dairy cows per head
	Per head	Index		
1890	\$25.00	58	80	72
1891	26.40	62	82	76
1892	26.50	62	77	81
1893	24.50	57	83	69
1894	21.40	50	72	69
1895	29.40	69	69	100
1896	28.10	66	70	94
1897	25.10	58	68	85
1898	27.60	64	70	91
1899	30.50	71	71	100
1900	28.90	67	83	81
1901	26.90	63	81	78
1902	30.60	71	83	86
1903	31.60	74	91	81
1904	29.90	70	87	80
1905	29.20	68	89	76
1906	29.50	69	89	78
1907	31.00	72	93	77
1908	31.00	72	91	79
1909	29.00	68	94	72
1910	33.00	77	104	74
1911	44.00	103	97	106
1912	44.00	103	96	107
1913	46.00	107	103	104
1914	47.50	111	100	111
1915	54.00	126	99	127
1916	50.00	117	112	104
1917	58.00	135	149	91
1918	75.00	175	183	96
1919	70.50	164	196	84

¹ Livestock on Farms, January 1, 1867-1919, U. S. Dept. of Agr., January 1938; Agr. Statistics Yearbooks, U. S. Dept. of Agr.

TABLE 1—(Concluded)

Year	Farm Value		Index of wholesale prices of all commodities January 1	Purchasing power of dairy cows per head
	Per head	Index		
1920	\$79.00	184	230	80
1921	60.00	140	167	84
1922	48.00	112	134	84
1923	55.00	128	149	86
1924	56.00	131	145	90
1925	50.00	117	150	78
1926	64.00	149	151	99
1927	66.00	154	141	109
1928	76.00	177	141	126
1929	87.00	203	140	143
1930	96.00	224	135	165
1931	70.00	163	114	143
1932	50.00	117	98	119
1933	36.00	84	89	94
1934	33.00	77	105	73
1935	38.00	89	115	77
1936	56.00	131	118	111
1937	57.00	133	125	106
1938	59.00	138	118	117
1939	57.00	133	112	119
1940	57.00	133	116	115
1941	57.00	133	118	113
1942	70.00	163	140	116
1943	102.00	238	149	160
1944	124.00	289	151	191

TABLE 2

Farm Value¹ and Purchasing Power of Other Cattle in Maine

Index Numbers (1910 to 1914 = 100)

Year	Farm Value		Index of wholesale prices of all commodities January 1	Purchasing power of other cattle per head
	Per head	Index		
1890	\$23.80	116	80	145
1891	23.90	117	82	143
1892	24.70	120	77	156
1893	22.10	108	83	130
1894	24.40	119	72	165
1895	24.50	120	69	174
1896	24.50	120	70	171
1897	20.10	98	68	144
1898	22.00	107	70	153
1899	25.80	126	71	177
1900	26.40	129	83	155
1901	16.10	79	81	98
1902	18.20	89	83	107
1903	17.50	85	91	93
1904	15.70	77	87	88
1905	16.20	79	89	89
1906	16.70	81	89	91
1907	16.00	78	93	84
1908	16.00	78	91	86
1909	15.00	73	94	78
1910	16.90	82	104	79
1911	21.20	103	97	106
1912	19.80	97	96	101
1913	21.20	103	103	100
1914	23.40	114	100	114
1915	26.10	127	99	128
1916	24.50	120	112	107
1917	27.90	136	149	91
1918	37.60	183	183	100
1919	36.10	176	196	90
1920	34.10	166	230	72
1921	25.90	126	167	75
1922	21.80	106	134	79
1923	23.10	113	149	76
1924	26.00	127	145	88

¹ Livestock on Farms, January 1, 1867-1919, U. S. Dept. of Agr., January 1938; Agr. Statistics Yearbooks, U. S. Dept. of Agr.

TABLE 2—(Concluded)

Year	Farm Value		Index of wholesale prices of all commodities January 1	Purchasing power of other cattle per head
	Per head	Index		
1925	\$23.60	115	150	77
1926	26.40	129	151	85
1927	25.90	126	141	89
1928	29.20	142	141	101
1929	33.00	161	140	115
1930	37.50	183	135	136
1931	24.20	118	114	104
1932	17.70	86	98	88
1933	12.00	59	89	66
1934	11.80	58	105	55
1935	12.20	60	115	52
1936	18.60	91	118	77
1937	20.50	100	125	80
1938	21.60	105	118	89
1939	22.50	110	112	98
1940	22.80	111	116	96
1941	21.50	105	118	89
1942	27.30	133	140	95
1943	38.70	189	149	127
1944	42.90	209	151	138

TABLE 3

Farm Value¹ and Purchasing Power of Sheep in Maine

Index Numbers (1910 to 1914 = 100)

Year	Farm Value		Index of wholesale prices of all commodities January 1	Purchasing power of sheep per head
	Per head	Index		
1900	\$ 3.10	76	83	92
1901	3.00	73	81	90
1902	3.00	73	83	88
1903	2.90	71	91	78
1904	2.85	70	87	80
1905	3.00	73	89	82
1906	4.00	98	89	110
1907	4.00	98	93	105
1908	4.10	100	91	110
1909	3.10	76	94	81
1910	3.70	90	104	87
1911	4.15	101	97	104
1912	4.10	100	96	104
1913	4.20	103	103	100
1914	4.30	105	100	105
1915	4.50	110	99	111
1916	4.80	117	112	104
1917	6.30	154	149	103
1918	9.40	230	183	126
1919	11.10	271	196	138
1920	9.60	234	230	102
1921	5.50	134	167	80
1922	4.80	117	134	87
1923	6.70	164	149	110
1924	7.10	173	145	119
1925	7.60	186	150	124
1926	8.00	195	151	129
1927	8.30	203	141	144
1928	8.50	208	141	148
1929	8.40	205	140	144
1930	8.60	210	135	154
1931	5.70	139	114	122
1932	3.50	86	98	88
1933	3.00	73	89	82
1934	3.30	81	105	77

¹ Livestock on Farms, January 1, 1867-1919, U. S. Dept. of Agr., January 1938; Agr. Statistics Yearbooks, U. S. Dept. of Agr.

TABLE 3—(Concluded)

Year	Farm Value		Index of wholesale prices of all commodities January 1	Purchasing power of sheep per head
	Per head	Index		
1935	\$3.45	84	115	73
1936	4.65	114	118	97
1937	5.20	127	125	102
1938	5.40	132	118	112
1939	5.40	132	112	118
1940	5.40	132	116	114
1941	5.70	139	118	118
1942	6.90	169	140	121
1943	8.50	208	149	140
1944	8.50	208	151	138

TABLE 4

Farm Value¹ and Purchasing Power of Hogs in Maine

Index Numbers (1910 to 1914 = 100)

Year	Farm Value		Index of wholesale prices of all commodities January 1	Purchasing power of hogs per head
	Per head	Index		
1900	\$ 8.40	65	83	78
1901	8.70	67	81	83
1902	10.30	79	83	95
1903	11.00	85	91	93
1904	8.80	68	87	78
1905	9.40	73	89	82
1906	8.80	68	89	76
1907	9.70	75	93	81
1908	8.75	68	91	75
1909	8.50	66	94	70
1910	11.50	89	104	86
1911	13.10	101	97	104
1912	11.50	89	96	93
1913	12.90	100	103	97
1914	15.80	122	100	122
1915	15.70	121	99	122
1916	12.00	93	112	83
1917	16.60	128	149	86
1918	23.00	177	183	97
1919	24.00	185	196	94
1920	21.60	167	230	73
1921	18.50	143	167	86
1922	12.90	100	134	75
1923	16.10	124	149	83
1924	15.00	116	145	80
1925	16.30	126	150	84
1926	17.30	133	151	88
1927	16.80	130	141	92
1928	15.00	116	141	82
1929	14.80	114	140	80
1930	14.80	114	135	84
1931	12.90	100	114	88
1932	9.30	72	98	73
1933	7.00	54	89	61
1934	6.10	47	105	45

¹ Livestock on Farms, January 1, 1867-1919, U. S. Dept. of Agr., January 1938; Agr. Statistics Yearbooks, U. S. Dept. of Agr.

TABLE 4—(Concluded)

Year	Farm Value		Index of wholesale prices of all commodities January 1	Purchasing power of hogs per head
	Per head	Index		
1935	\$ 8.00	62	115	54
1936	11.30	87	118	74
1937	10.30	79	125	63
1938	11.40	88	118	75
1939	10.20	79	112	71
1940	9.10	70	116	60
1941	9.50	73	118	62
1942	12.20	94	140	67
1943	19.80	153	149	103
1944	16.50	127	151	84

TABLE 5

Farm Value¹ and Purchasing Power of Horses in Maine

Index Numbers (1910 to 1914 = 100)

Year	Farm Value		Index of wholesale prices of all commodities January 1	Purchasing power of horses per head
	Per head	Index		
1890	\$ 94.00	71	80	89
1891	93.00	70	82	85
1892	89.00	67	77	87
1893	80.00	60	83	72
1894	63.00	47	72	65
1895	54.00	41	69	59
1896	54.00	41	70	59
1897	47.00	35	68	51
1898	50.00	38	70	54
1899	52.00	39	71	55
1900	59.00	44	83	53
1901	68.00	51	81	63
1902	77.00	58	83	70
1903	81.00	61	91	67
1904	85.00	64	87	74
1905	82.00	62	89	70
1906	94.00	71	89	80
1907	106.00	80	93	86
1908	106.00	80	91	88
1909	107.00	80	94	85
1910	125.00	94	104	90
1911	124.00	93	97	96
1912	127.00	95	96	99
1913	139.00	105	103	102
1914	150.00	113	100	113
1915	146.00	110	99	111
1916	142.00	107	112	96
1917	152.00	114	149	77
1918	163.00	123	183	67
1919	154.00	116	196	59
1920	157.00	118	230	51
1921	148.00	111	167	66
1922	126.00	95	134	71
1923	124.00	93	149	62
1924	124.00	93	145	64

¹ Livestock on Farms, January 1, 1867-1919, U. S. Dept. of Agr., January 1938; Agr. Statistics Yearbooks, U. S. Dept. of Agr.

TABLE 5—(Concluded)

Year	Farm Value		Index of wholesale prices of all commodities January 1	Purchasing power of horses per head
	Per head	Index		
1925	\$119.00	89	150	59
1926	129.00	97	151	64
1927	130.00	98	141	70
1928	135.00	102	141	72
1929	140.00	105	140	75
1930	143.00	108	135	80
1931	115.00	86	114	75
1932	114.00	86	98	88
1933	104.00	78	89	88
1934	116.00	87	105	83
1935	135.00	102	115	89
1936	155.00	117	118	99
1937	159.00	120	125	96
1938	156.00	117	118	99
1939	152.00	114	112	102
1940	156.00	117	116	101
1941	145.00	109	118	92
1942	149.00	112	140	80
1943	163.00	123	149	81
1944	158.00	119	151	79

APPENDIX D—Farm Prices by Types of Farming in Maine

TABLE 1

Farm Price Indices and Purchasing Power for Important Types of Farming in Maine, 1910 to 1944

(1910 to 1914 = 100)

Year	Farm Price Index				Purchasing Power			
	Potato farms ¹	Apple farms ²	Dairy farms ³	Poultry farms ⁴	Potato farms	Apple farms	Dairy farms	Poultry farms
1910	68	94	93	101	66	91	90	98
1911	105	99	96	93	111	104	101	98
1912	144	99	108	101	143	98	107	100
1913	88	99	100	101	86	97	98	99
1914	95	108	103	104	96	109	104	105
1915	72	99	98	101	71	98	97	100
1916	189	115	128	111	151	92	102	89
1917	327	145	180	143	190	84	105	83
1918	208	162	189	177	109	85	99	93
1919	204	177	193	202	101	88	96	100
1920	361	190	220	217	160	84	97	96
1921	127	156	150	172	89	109	105	120
1922	113	147	135	149	80	104	96	106
1923	136	151	148	150	93	103	101	102
1924	140	138	141	148	98	96	99	103
1925	155	138	147	156	103	91	97	103
1926	283	147	171	156	194	101	117	107
1927	203	146	157	150	146	105	113	108
1928	122	146	148	153	87	104	105	109
1929	143	152	154	163	103	109	111	117
1930	167	135	146	140	133	107	116	111
1931	95	109	108	116	89	102	101	108
1932	47	94	82	97	49	99	86	102
1933	94	86	89	86	98	90	93	90
1934	84	108	97	96	77	99	89	88
1935	53	125	99	114	45	107	85	97
1936	148	124	116	116	125	105	98	98
1937	114	132	110	109	90	105	87	86
1938	78	120	103	112	68	104	90	97
1939	107	122	107	98	95	108	95	87
1940	113	117	111	100	98	102	97	87
1941	99	129	119	116	78	102	94	91
1942	149	157	150	138	103	109	104	96
1943	215	193	191	165	143	129	127	110
1944	195	216	191	153	128	142	126	101

¹ Approximate weights in per cent using 1910-1914 values; potatoes 93, milk 2, butter 1, milk cows 1, hay 1, oats 1, and hogs 1.² Approximate weights in per cent using 1910-1914 values; apples 41, milk 28, eggs 7, milk cows 7, sweet corn 5, potatoes 4, veal 3, chickens 2, butter 2, and hay 1.³ Approximate weights in per cent using 1910-1914 values; milk 52, potatoes 16, sweet corn 13, milk cows 6, eggs 5, veal 3, apples 3, and chickens 2.⁴ Approximate weights in per cent using 1910-1914 values; eggs 74, chickens 22, milk 2, hay 1, and butter 1.

APPENDIX E—Number of Livestock on Farms

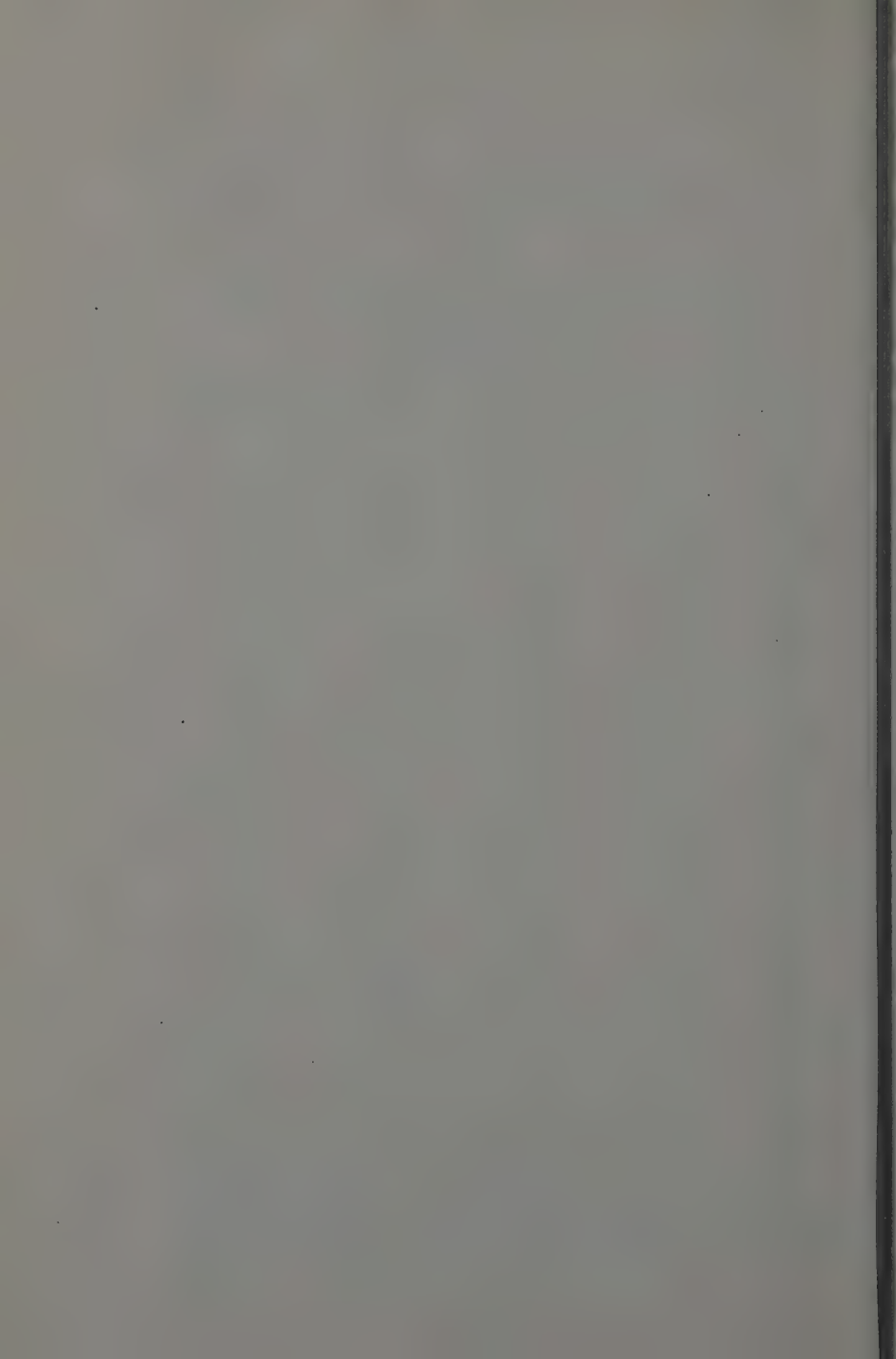
TABLE 1

*Number of Livestock on Farms in Maine and the Entire United States
on January 1¹*

(000 omitted)

Year.	Horses		Milk Cows		Sheep		Hogs	
	U. S.	Maine	U. S.	Maine	U. S.	Maine	U. S.	Maine
1910	19,972	107	19,450	150	50,239	164	48,072	77
1911	20,418	106	19,422	150	50,555	166	55,366	86
1912	20,726	105	19,517	153	47,897	166	55,394	86
1913	21,008	106	19,580	150	44,652	162	53,747	78
1914	21,308	106	19,821	145	43,089	148	52,853	72
1915	21,431	105	20,270	149	40,513	135	56,600	80
1916	21,334	100	20,752	154	40,010	125	60,596	87
1917	21,306	97	21,212	158	38,886	125	57,578	79
1918	21,238	96	21,536	170	39,664	126	62,931	85
1919	20,922	95	21,545	174	41,875	127	64,326	92
1920	20,091	94	21,455	176	40,743	119	60,159	91
1921	19,369	92	21,456	171	39,479	99	58,942	73
1922	18,764	90	21,851	165	36,922	86	59,849	61
1923	18,125	88	22,138	162	36,803	83	69,304	59
1924	17,378	85	22,331	160	37,139	84	66,576	60
1925	16,651	84	22,575	156	38,543	89	55,770	56
1926	16,083	80	22,410	152	40,363	95	52,105	60
1927	15,388	78	22,251	147	42,415	92	55,496	67
1928	14,792	74	22,231	138	45,258	92	61,873	70
1929	14,234	67	22,440	135	48,381	84	59,042	53
1930	13,742	63	23,032	138	51,565	83	55,705	49
1931	13,195	61	23,820	145	53,233	85	54,835	49
1932	12,664	59	24,896	152	53,974	79	59,301	49
1933	12,291	56	25,936	154	53,075	70	62,127	52
1934	12,052	54	26,931	156	53,713	65	58,621	51
1935	11,861	52	26,082	152	51,808	59	39,066	44
1936	11,598	50	25,196	144	51,087	50	42,975	45
1937	11,342	48	24,649	143	51,019	48	43,083	53
1938	10,995	45	24,466	139	51,210	45	44,525	53
1939	10,629	42	24,600	138	51,595	45	50,012	50
1940	10,442	39	24,926	138	52,399	43	61,115	53
1941	10,214	38	25,478	134	54,283	41	54,256	46
1942	9,907	36	26,398	126	56,735	41	60,377	43
1943	9,675	36	27,106	123	55,775	43	73,736	51
1944	9,302	36	27,656	130	51,769	42	83,852	71
1945	8,897	35	27,785	133	47,945	38	60,660	52

¹ Farm Economic Facts, No. 58, April 1945, p. 1277.



BULLETIN 436

USE OF LABOR ON MAINE FARMS WITH DAIRY COWS

GEORGE F. DOW¹

PURPOSE AND SCOPE OF STUDY

An available supply and the efficient use of farm labor are of major importance to dairymen. The cost for man labor is one of the major items of farm expense, representing approximately one-third of the net cost of milk production. The expenditure for hired labor plus the value of unpaid family labor (other than the farm operator) represents about one-fourth of all farm expenses (Appendix table 1).

The efficient use of labor always is an important factor affecting returns from dairy farming. During the war period, maximum labor efficiency became even more important due to the scarcity of labor, high wage rates, and the necessity for increased agricultural production.

The purpose of this study is to present information concerning the farm labor supply and some of the more important methods of saving work and utilizing labor more efficiently. Facts are included concerning the amount and kinds of farm labor employed, age and ability of workers, seasonal demands for labor, prevailing wage rates, turnover in the labor supply, sources of day laborers, and factors affecting labor efficiency. This information should be of value to farmers and government agencies in meeting current farm labor problems, and in reducing labor cost so that Maine dairymen can meet competitive conditions in the postwar period.

The source of much of the information used was from a survey made during the summer of 1943 including 500 Maine farmers keeping dairy cows.² All farmers in five selected areas who sold

¹ Appreciation is extended to dairymen who cooperated in making information available for their farms; to Mr. A. L. Perry and Mr. J. R. Smyth, Jr., who assisted in the recent survey work; and to Miss Margaret Smith who helped in the preparation and tabulation of the information.

² Other phases of this study included information on the use and needs for farm machinery, problems of getting grain, utilization of milk, and dairy cow replacements.

any appreciable volume of dairy products were included. Other information was obtained from a total of 989 dairy farmers included in earlier surveys which were made during 1928 to 1937 (fig. 1 shows the location of these farms).

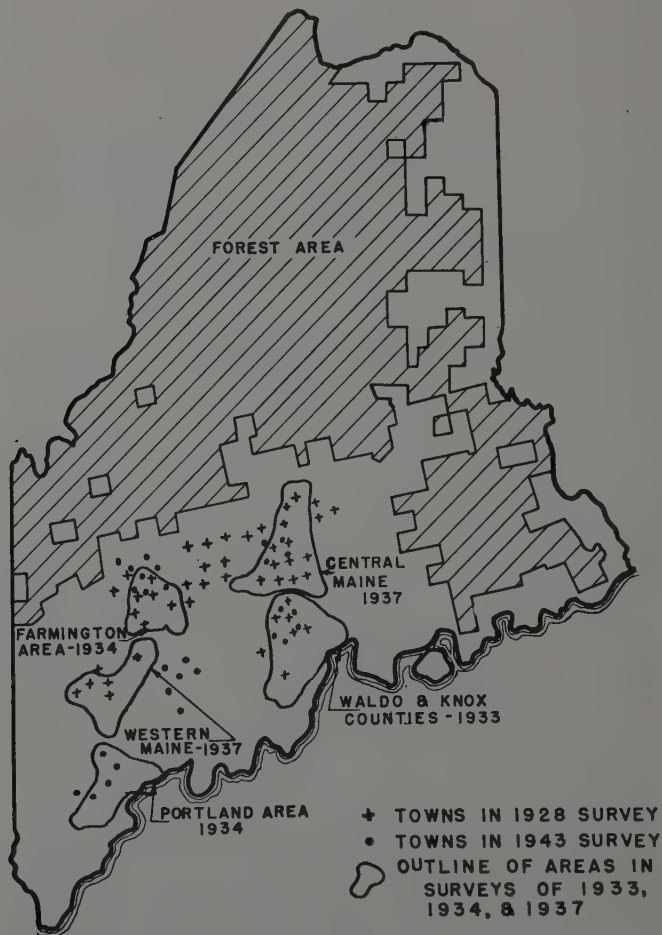


FIG. 1. Location of Areas and Towns Included in the Surveys of Farms Keeping Dairy Cows.

BRIEF DESCRIPTION OF FARMS

The average number of dairy cows kept per farm was 10.9 for the farms included in the 1943 survey, and 10.2 for the surveys made during 1928 to 1937. The average acreage per farm, based on the 1928-37 surveys, was 172 acres, of which 49 acres were in cropland, 49 acres in cleared pasture land, and 71 acres in woodland (Appendix table 1). Land in hay represented approximately three-fourths of all cropland. The average acreage of tilled crops was 9.6 acres per farm, which included 1.6 acres of sweet corn, 2.0 acres of potatoes, 2.4 acres of other cultivated crops, and 3.6 acres of grain. Fruit, primarily apples, averaged 1.8 acres per farm.

The relative importance of the various farm enterprises, according to the use of labor, was 46 per cent for dairy cows, 4 per cent for heifers and bulls, 6 per cent for other livestock, 32 per cent for crops grown, and 12 per cent for miscellaneous work in the woods or off the farm (Appendix table 1).

There was relatively little difference in the size and general type of farm business in the various areas, with the exception of the 1928 survey. The farms selected in the 1928 survey were slightly larger than average.

AMOUNT OF LABOR USED PER FARM

An average of 21 to 22 months of labor was used per farm annually, according to surveys in 1928-37 and in 1943. The farm operator furnished approximately one-half of the total labor requirements, which with the additional work by members of the farm family, amounted to about four-fifths of all labor used. The remaining farm work was hired, of which about three-fourths was employed on an annual or monthly basis, and about one-fourth hired on a day basis (table 1).

The difference in the amount of labor used per farm was small among the five areas included in the 1943 survey; the Franklin County area was lowest with 21.2 months, and the Penobscot County area was highest with 22.7 months. In Franklin County, there was a tendency to use slightly more family labor and less hired labor. Penobscot County had slightly more than the

average amount of hired day help because of a larger acreage of potatoes per farm.

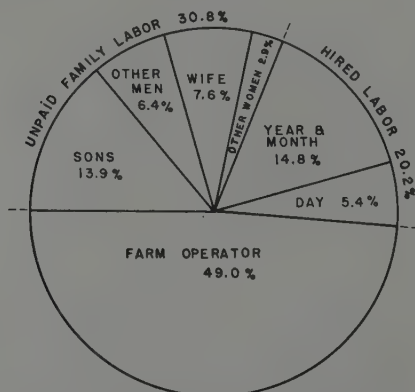


FIG. 2. Relative Importance of Kinds of Labor Used on Dairy Farms.

TABLE 1

*Average Amount and Kind of Labor Used on Dairy Farms,
Based on 1928-37 and 1943 Surveys*

Kind of labor	Number of months per farm annually		Per cent of total farm labor	
	1928-37	1942-43	1928-37	1942-43
Farm operator	11.72	10.87	55.6	49.0
Unpaid labor:				
Son	2.74	3.08	13.0	13.9
Wife	1.15	1.68	5.4	7.6
Father	.27	.38	1.3	1.7
Brother	.19	.44	.9	2.0
Daughter	.07	.36	.3	1.6
Others	.27	.90	1.3	4.0
Total unpaid labor	4.69	6.84	22.2	30.8
All family labor	16.41	17.71	77.8	79.8
Hired help:				
Year labor	2.27	2.63	10.7	11.8
Month labor	1.30	.66	6.2	3.0
Day labor	1.12	1.19	5.3	5.4
Total hired	4.69	4.48	22.2	20.2
Total all farm labor	21.10	22.19	100.0	100.0

The labor requirements per farm varied considerably for herds of different size, as would be expected. Farmers with small herds of five cows or less used only 15.6 months of labor annually, as compared with 27.7 months with herds of fourteen or more cows. Those with the smaller herds hired only 8 per cent of the labor used, in contrast to 34 per cent hired by the farmers with the larger herds (table 2).

TABLE 2

Relation of Number of Cows Per Herd to the Amount and Kind of Farm Labor Used, Based on 1928-37 Surveys

Item	Number of cows per herd				All farms
	5 or less	6 to 9	10 to 13	14 or more	
Number of farms	143	423	238	185	989
Number cows per farm	4.5	7.7	11.6	18.6	10.2
Average months per farm:					
Family labor	14.4	15.7	17.4	18.2	16.4
Hired by year or month	.6	2.2	4.6	7.6	3.6
Hired by day	.6	.9	1.3	1.9	1.1
Total months	15.6	18.8	23.3	27.7	21.1
Per cent of total labor:					
Family labor	92	83	75	66	78
Hired by year or month	4	12	19	27	17
Hired by day	4	5	6	7	5
Total per cent	100	100	100	100	100

USE OF FAMILY LABOR

The average number of persons per farm family was 3.7, according to a 1937 survey of 298 farms in Central and Western Maine.³ Only two persons per family lived on about one-third of the farms; the children in most instances had grown up and left home. Three or four people per family lived on 38 per cent of the farms, five or six people on 18 per cent, and seven to thirteen people on 9 per cent.⁴

³ The average number of persons per occupied housing unit for all rural farm population in Maine was 4.1, according to the 1940 Census, Bur. of Census, U. S. Dept. Commerce.

⁴ More detailed figures show one person for 3 per cent of the farms, two for 32 per cent, three for 21 per cent, four for 17 per cent, five for 12 per cent, six for 6 per cent, seven for 4 per cent, eight for 2 per cent, and nine or more for 3 per cent of the farms.

The number of persons per family that helped in the farm work averaged 2.26, representing 61 per cent of the farm population.⁵ The remainder of the family presumably did only housework, was employed elsewhere, or was unable to work because of youth, old age, or poor health. Nearly one-fourth of the operators' children living at home were under ten years of age, and an additional 21 per cent were 10 to 14 years of age. The number of sons that remained on the home farm declined rapidly after the age of 15 to 19. This tends to be a normal situation, due in part to the fact that on many farms the size of business is inadequate for both father and one or more sons. In some cases, the need of the armed services also was a factor which reduced the number of sons in this age group that remained on the farm. The number of daughters that remained at home after about high school age also declined rapidly (table 3).⁶

TABLE 3

Number of Children of Farm Operators on the Home Farm, by Age Groups, for 298 Farms Included in the 1937 Survey

Age of children	Number of children per 100 farms			Per cent of total
	Sons	Daughters	Total	
Under 10	15	16	31	24
10-14	13	14	27	21
15-19	22	9	31	24
20-24	11	6	17	13
25-29	10	2	12	10
30 or more	8	2	10	8
Total	79	49	128	100

The amount of family farm labor used annually per farm in 1942-43 was 17.7 months, as shown in table 1. This labor included about 11 months by the farm operator, 3 months by sons, 1.7

⁵ This figure checks closely with an estimate for Maine, based on reports of crop correspondents, of 61 per cent for June 1, 1943, and 57 per cent for June 1, 1942, as published in Farm Labor Report, June, 1943, by Bur. Agr. Econ., U. S. Dept. Agr.

⁶ More details concerning the age and employment of all people on farms in Maine are given in Appendix tables 2 and 3 which were summarized from the 1940 Census.

months by the operator's wife, and smaller amounts of labor by fathers, brothers, daughters, and others.

About one-fifth of the farm operators received some assistance on the farm from family labor. Fathers and sons were farming together on a full-time basis on one-fifth of the farms, and brothers were farming together on 2 per cent of the farms. The operator's wife, sister, mother, or other mature woman assisted in the farm work on 46 per cent of the farms. On an additional 41 per cent, women did a very small quantity of farm work in washing milk pails and dairy equipment, according to surveys of 513 farms in 1932-34. About one-fourth of the operators had some assistance from children of school age, with 16 per cent having the help of one child, 9 per cent of two children, and 1 per cent of three or more children.

The number of unpaid family farm workers averaged 1.26 per farm, of which 54 per cent were male and 46 per cent were female. The average amount of farm work contributed annually per unpaid worker was equivalent to 5.3 months. The men worked an average of 6.4 months, and the women worked an average of 4.0 months (table 4).

TABLE 4

*Utilization of Unpaid Family Farm Labor on 500 Farms
Keeping Dairy Cows in 1943*

Relation of laborer to the operator	Per cent of farms using	Average months annually per	
		farm using	person working
Sons or son-in-law	39	8.3	6.6
Father or father-in-law	5	8.0	8.0
Brothers	5	7.8	7.2
Other men	8	4.5	3.9
All men			6.4
Wife	39	4.3	4.3
Daughters and nieces	10	3.9	3.1
Mother	3	4.1	4.1
Sisters	2	4.4	3.7
Other women	2	3.8	3.0
All women			4.0

USE OF HIRED LABOR

Labor was hired by 70 per cent of the farmers included in the 1943 survey, and by 81 per cent in the earlier surveys of 1928-37.

Eighteen per cent of the farmers hired labor on an annual basis, averaging 1.3 men per farm. Labor was hired on a monthly basis by 12 per cent of the farmers in 1942-43, and by 25 per cent in 1928-37 (table 5). Month help worked an average of 4.1 months per laborer during the year. Day laborers were employed by about two-thirds of the farmers, working a total of 46 days per farm using such labor (table 5).

TABLE 5

Utilization of Hired Labor on 989 Farms in 1928-37 and on 500 Farms in 1942-43

Basis of hiring labor	Per cent of farms hiring in		Average months per		
	1928-37	1942-43	Farm hiring in		Laborer em- ployed in 1942-43
			1928-37	1942-43	
Annually	18	18	12.6	14.2	10.8
Monthly	25	12	5.3	5.5	4.1
Month or year	39	28	9.1	11.9	8.1
Daily	67	62	1.7	1.9	.4*

* Computed on the basis of the time employed per laborer on each farm enterprise. Information was not obtained as to the extent to which the same laborer worked on more than one farm enterprise.

Hired day labor was used for planting on 18 per cent of all farms, bean picking on 6 per cent, berrying on 2 per cent, haying on 34 per cent, sweet corn picking on 20 per cent, and potato harvesting on 13 per cent. The number of persons hired per farm enterprise averaged 2.6, but varied from 1.5 laborers in haying to 8.1 for picking factory beans (table 6). The amount of hired day labor used on separate enterprises averaged 11 days per laborer, varying from 6 days for picking beans or sweet corn to 12 days for potato harvesting and 17 days for haying.

The average amount of day labor hired per farm was 31 days for all farms included in the 1942-43 survey. The time hired varied by areas from an average of 22 days in Waldo County to about 30 days in Franklin, Cumberland, and Kennebec Counties, and to 42 days in Penobscot County. The extra day labor hired in the Penobscot County area was for potato harvesting.

TABLE 6

Use of Hired Day Labor, by Enterprises, on 500 Farms in 1942-43

Farm enterprise	Per cent of farms using day help	Number of persons per farm using	Average number of days per		
			Farm using	Person working	Farm, for all farms
Planting	18	1.6	12	8	2.2
Bean picking	6	8.1	48	6	2.8
Berrying	2	6.8	72	10	1.8
Haying	34	1.5	26	17	8.6
Sweet corn picking	20	2.7	18	6	3.7
Potato harvesting	13	3.2	41	12	5.3
Other harvesting	12	2.7	30	12	3.8
Miscellaneous labor	4	2.4	65	28	2.9
All farm enterprises	62	2.6*	49	11*	31.1

* Same as footnote below preceding table.

EXCHANGE OF DAY HELP AMONG FARMERS

Approximately one-third of the farmers in the 1943 survey exchanged some day help. Work was exchanged by 25 per cent of the farmers in haying, by 14 per cent in picking sweet corn, by 8 per cent in planting, by 7 per cent in filling silos, and by 2 per cent in potato harvesting. Reasons for exchanging work included the lack of farm machinery on the part of some operators, the increased efficiency in the use of a larger crew than was available on some of the smaller farms for haying and filling silos, and the urgent need to harvest sweet corn promptly in order to obtain the best quality.

Work was exchanged by about one-fourth of the farmers in each area, except in Penobscot County where slightly over one-half exchanged some work. No significant change occurred between 1942 and 1943 in the proportion of farmers exchanging work.

WOMEN AS A SOURCE OF FARM LABOR

Women and girls accounted for about 12 per cent of all labor used on the 500 farms in the 1943 survey. Work by women averaged 14 per cent of all family labor used on the farm, 0.5 per cent of the regular help hired annually or monthly, and 11 per cent of the hired day help. In 1943, about three-fourths of the day labor

employed in berrying was furnished by women, as compared with one-half of that used for bean picking, about one-tenth for planting, sweet corn picking, and potato harvesting, and 2 per cent for haying. Most of these women did not serve as occasional emergency help, but worked on a farm enterprise throughout its harvesting season.

The extent to which women were hired as day help increased from 10.0 to 12.5 per cent of all hired day help from 1942 to 1943. The amount of work by women as family farm labor or as regular hired help did not change appreciably. Consequently, all farm work by women increased only from 11.4 to 11.7 per cent of the total labor used during 1942 to 1943.

AGE OF FARM LABOR

The average age of farm operators in 1942 was 51 years, which compares closely with the average from earlier surveys and the 1940 Census. Nearly one-half of all farm operators were 55 or more years of age, and only one or two per cent were less than 25 years old (Appendix table 4). The average age of operators' wives was 47, sons and daughters working on the farm 19, fathers 69, brothers 34, and all family farm labor 40 years. Hired men averaged 41 years of age for those on a yearly basis, and 29 years of age for those on a monthly basis.

The distribution of ages of various classes of labor used on farms is shown in table 7. Twelve per cent of all farm laborers were under 18 years of age, 31 per cent were aged 18 to 37, 27 per cent were aged 38 to 54, and 30 per cent were 55 or more years of age. If all men 18 to 25 years of age were transferred to the armed forces, the male farm labor supply would be decreased 12 per cent, and if those 26 to 37 years of age also were taken, the male farm labor supply would be reduced a total of approximately one-third.

The amount of time worked per laborer did not vary appreciably among different age groups except for school children. They worked only about one-half as much time during the year as those in the older groups.

The ages of farm laborers varied relatively little among the five different areas included in the survey. The ages of hired day help, however, varied considerably for different farm enterprises.

TABLE 7

*Variation in Age of Farm Labor Used on Farms Keeping Dairy Cows
in 1942*

Age	Per cent of total labor of each type used							
	Farm operator	Unpaid family labor	Operator and family	Hired by year	Hired by month	Hired year & month	Hired by day	All farm labor
Under 14	—	10	4	—	4	1	9	4
14 - 17	1	14	6	7	26	11	22	8
18 - 25	3	23	10	19	18	19	8	12
26 - 37	18	19	19	28	11	24	19	19
38 - 44	12	7	10	8	8	8	19	10
45 - 54	23	13	19	6	15	8	10	17
55 - 64	26	8	19	20	13	19	10	18
65 or more	17	6	13	12	5	10	3	12
Total	100	100	100	100	100	100	100	100

In bean picking, 86 per cent of the day help was under 18 years of age, and in berrying 44 per cent. In contrast, the corresponding figure for haying was 29 per cent, for sweet corn picking 21 per cent, and for potato digging 18 per cent (Appendix table 5).

ABILITY OF LABOR TO DO WORK OF AN ABLE-BODIED MAN

Some farm laborers, such as children, old men, or those in ill health, were not able to accomplish the work of an able-bodied man. The ability to do a "full day's work" in 1942-43 has been expressed on a percentage basis, with 100 representing the work of an able-bodied man. On this basis, the average working ability was 92 for all farm operators, 88 for all family farm labor, 90 for hired help on an annual or monthly basis, 87 for hired day help, and 88 for all farm labor.⁷

The working ability of various age groups held nearly constant from the age of 18 to 54 at an average of about 97 per cent for men and 84 for women. In comparison, the average rate for children under 14 years of age was only one-half as much as for

⁷ Additional details for family labor showed 88 per cent for operators' sons, 96 for brothers, 60 for fathers, 80 for wives, 63 for daughters, 76 for all family women and girls, and 85 for unpaid help by men and boys.

the mature men. The ability of older children from 14 to 17 years of age and of older men from 54 to 64 was about one-tenth less than for ages 18 to 54; and for elderly men aged 65 or more was about 30 per cent less (table 8).

The women and girls who assisted in farm work had an average working ability of 76 per cent in contrast to an average of 90 for all men and boys (table 8).

TABLE 8

Relation of Age of Farm Laborers to Their Ability to do the Work of an Able-Bodied Man, 500 Farms in 1942-43

Age	All male workers	All female workers	All farm workers
Under 14	50	47	49
14 - 17	88	70	87
18 - 25	99	84	98
26 - 37	98	86	97
38 - 44	98	83	96
45 - 54	99	81	96
55 - 64	89	62	86
65 or more	68	52	67
All workers	90	76	88

PER CENT EFFICIENCY
BY AGE GROUPS

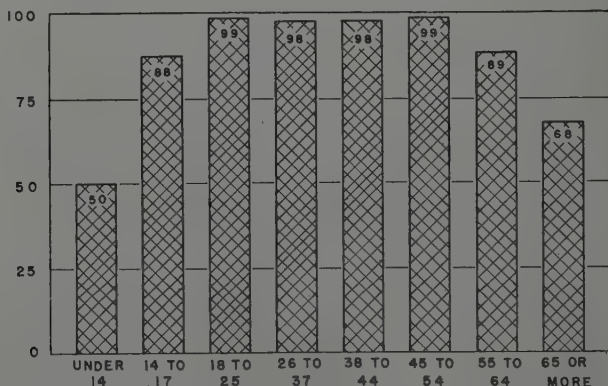


FIG. 3. The Ability of Farm Laborers to do the Work of an Able-Bodied Man, by Age Groups.

For different farm enterprises there was considerable variation in the average working ability of hired day help. For bean picking, where many children were employed, the average was only 62 per cent as compared with 80 per cent for berrying, 88 per cent for haying, and 94 per cent for sweet corn picking and potato digging.

CHANGES IN THE AMOUNT AND EFFICIENCY OF FARM LABOR USED IN 1942 AND 1943

The total months of labor used for farm work decreased 1.8 per cent from 1942 to 1943. This change was the result of a decrease of 1.6 per cent in family farm labor, a decrease of 8.4 per cent in labor hired on an annual or monthly basis, and an increase of about 15.3 per cent in hired day help (table 9). The trend in the amount of hired day labor included an increase of 60 per cent during planting, an increase of 84 per cent for bean picking, a decrease of 7 per cent for haying, and an expected increase of 27 per cent for sweet corn picking and 13 per cent for potato digging.

The ability of farm labor to do the work of an able-bodied man decreased only very slightly from 1942 to 1943, from 88.67 per cent to 88.02 per cent. The decrease was 0.3 per cent for all family farm labor, including the operator, 1.3 for regular hired labor, 4.8 for hired day help, and 0.7 per cent for all labor (table 9). The combined reduction of 1.8 per cent in the months of labor used and of 0.7 per cent in the average working ability of labor resulted in a decrease of only 2.6 per cent in the months of able-bodied man labor per farm.

In spite of the decrease in the amount of man labor used, labor was used more efficiently resulting in a net increase on these farms in the acreage of crops grown and the number of livestock kept. The change represented an increase of approximately 5 per cent in the total productive units of crops and livestock per farm.⁸ These additional productive units were 29 per cent for potatoes, 22 per cent for sweet corn, 9 per cent for other crops, 17 per cent

⁸ Computed on the basis of productive man work units by which crop acreages and numbers of livestock are multiplied by units assigned to represent the average number of ten-hour days required annually per acre or per head of livestock. Details concerning the changes in crop acreage and number of livestock from 1942 to 1943 are given in Appendix table 6.

TABLE 9

*Farm Labor Changes from 1942 to 1943, for 500 Farms Keeping Dairy Cows**

Item	1942	1943	Per cent change from 1942-43
Months of labor used per farm annually:			
Farm operator	10.84	10.90	+ 0.6
Unpaid family labor	7.01	6.66	- 5.0
All family farm labor	17.85	17.56	- 1.6
Hired by year or month	3.44	3.15	- 8.4
Hired by day	1.11	1.28	+15.3
All hired labor	4.55	4.43	- 2.6
All farm labor	22.40	21.99	- 1.8
Average per cent man equivalent for labor:			
Farm operator	91.90	91.90	—
All family labor	88.35	88.07	- 0.3
Hired by year or month	90.29	89.15	- 1.3
Hired by day	88.93	84.66	- 4.8
All farm labor	88.07	88.02	- 0.7
Total months of man equivalent per farm annually	19.86	19.35	- 2.6

*The survey on which these figures are based was made during the summer of 1943, so that it was necessary to estimate the amount of labor to be used during the fall months of 1943. These estimates presumably are fairly reliable because of the limited turnover in workers on dairy farms, especially during these months when Selective Service regulations tended to "freeze" eligible workers on the farm.

for poultry, 16 per cent for dairy cows, and 7 per cent for other livestock. The increased acreage of potatoes was primarily in the Penobscot and Waldo County areas, but sweet corn acreage increased appreciably in each of the five areas. Hens and chickens increased in each of the five areas, but had the greatest increase in Cumberland and Kennebec Counties. The number of cows increased in each area with the exception of Penobscot County, where Bang's disease testing and the elimination of infected cattle was carried on intensively during 1943.

The total increase in farm production during 1943 normally would require 20 additional days of work annually per farm, or an average of 11 more days annually per man. Inasmuch as production increased about 5 per cent, using 2.6 per cent less man equivalent of labor, there was a total increase during 1943 of 8.1 per cent in the output or labor efficiency of an able-bodied man.

The additional amount of productive work performed per man during 1943 presumably was accomplished by working more hours per day, working more days per week, using equipment and

machinery more intensively, and postponing certain farm work such as repair of buildings and farm improvements. One-sixth of the farmers interviewed stated that they worked extra hours per day during 1943. The additional length of the farm work day during the summer was 1.7 hours for farmers who worked longer hours, and averaged about one-half hour extra per day for all farmers. Estimates for Maine by the Crop Reporting Board show an average increase from 1940 to 1943 of 0.6 hour in the operators' farm work day on the first of June, increasing from 12.5 to 13.1 hours a day.⁹ On September first the increase in the operator's work day was 1.0 hour per day more in 1943 than in 1940. The average work day for hired help, however, did not increase from 1940 to 1943, but remained constant at 9.7 hours for June and 9.5 hours for September.

In view of the present extremely long work day of farm operators, it is doubtful whether any further increase is possible from the standpoint of efficient use of labor. Any additional increases in production per man probably will have to be achieved through the greater use of labor saving machinery or a more efficient organization of the farm work.

SEASONAL VARIATION IN THE USE OF FARM LABOR

The employment of labor was at a peak during July, August, and September when hay and other crops were being harvested. During this period of greatest farm activity, 2.4 months of labor were used per farm monthly, which was 50 per cent higher than during the winter period of November to April.

Family farm labor showed the least seasonal variation, but increased during the summer months about one-fifth above the average for the year (fig. 4). Some of this increase was caused by the additional work of school children during the vacation months and some by extra help furnished by the operator's wife and other members of the family. Help that was hired by the year or month reached a peak in July that was about one-third above the average for the year. Hired day help showed the greatest

⁹ Farm Labor Report, September, 1943. Bur. Agr. Econ., U. S. Dept. Agr.

seasonal variation, increasing in July and September to more than 30 times as much as during the winter period (table 10).

An additional indication of the seasonal variation in labor utilization has been made available by the United States Crop Re-

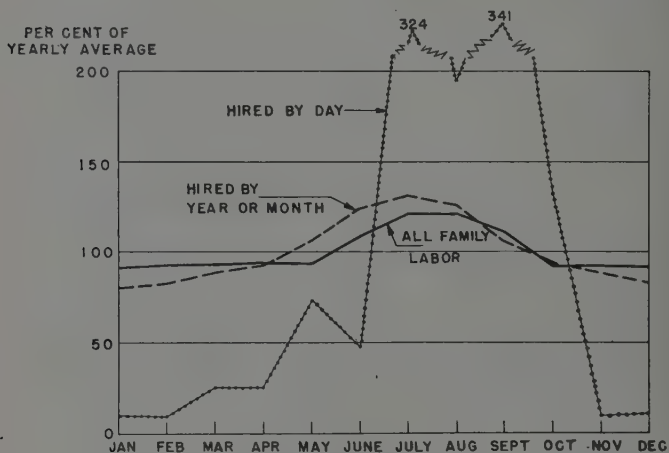


FIG. 4. Seasonal Variation in Labor Used on Dairy Farms.

TABLE 10

Seasonal Variation in the Use of Farm Labor, 500 Farms Keeping Dairy Cows, 1942-43

Month	Per cent of yearly average				
	Hired by year or month	Hired by day	All hired labor	All family labor	All farm labor
January	80	10	62	92	86
February	82	9	62	92	86
March	87	25	70	93	88
April	92	25	74	93	89
May	107	74	98	93	94
June	124	47	104	108	107
July	131	324	182	121	133
August	126	194	145	121	126
September	106	341	169	111	122
October	94	133	104	93	95
November	87	9	66	92	87
December	83	10	64	92	86
Year	100	100	100	100	100

porting Board, showing the number of workers employed by months on Eastern Dairy Farms. These figures, summarized in Appendix table 7, compare fairly closely with those for Maine dairy farms, but indicate slightly less seasonal variation.

On the Maine dairy farms, included in the 1943 survey, 26 per cent of all labor was hired during July to September, as compared with 15 per cent for November to April, 20 per cent in May and June, and 22 per cent in October.

TURNOVER IN FARM LABOR SUPPLY

During the year ending June 30, 1943, a total of 122 regular farm workers left the 500 farms included in this survey. Partially offsetting this off-farm movement was a total of 79 men who came onto these farms. The net result was a decrease for the year of 43 regular workers, or one man less for every 12 farms.

Of the 122 men who left these farms, one-fourth were members of farm families and three-fourths were hired men. One-third of these men entered the armed forces, one-fourth went onto other farms, and the remaining 42 per cent went into other work.

Of the 79 new workers coming to the farms, 9 were related to the farm operators, and 70 were other hired men. Nearly one-half of these new workers came from other farms, and slightly over one-half (54 per cent) came from other occupations.

Nearly all of the movement in farm labor, other than to the armed forces, was within the State. Only four workers left for out-of-State jobs, and only seven of the new workers came from out-of-State.

The problem of keeping workers on Maine dairy farms was particularly acute in 1942 because of the needs of the armed services and the expansion and high wages paid by industry. Starting in January, 1943, however, the farm labor problem was eased considerably through amendments to the Selective Service Act. These amendments, which became effective late in 1942, provided for deferment of men between the ages of 18 and 45 who were necessary to and regularly employed in farm work essential to the war effort, if a satisfactory replacement could not be obtained. These regulations also provided that if a deferred agricultural worker ceased working on a farm, without a permit from his local

board to accept other essential work, he would be reclassified immediately as available for military service. Selective Service Boards also were directed in December, 1942, temporarily to defer registrants not on farms who had dairy and poultry experience so that they might obtain essential farm work. Because of these various regulations there was an appreciable "back to the farm" movement during 1943, and a tendency to freeze agricultural workers in farm occupations. There did, however, continue to be some movement of farm laborers between farms in order to obtain higher wages or better living conditions; a few men continued to be drawn into the armed services; and some additional men too old to be subject to Selective Service left farms for higher wages in industry. Nevertheless, these regulations stopped the heavy drain of workers off the farm and resulted in a slight increase in the farm labor supply from January 1 to June 30, 1943, which made possible the increased production of crops and livestock products for 1943. Other factors that eased the farm labor problem were the less rapid rate of expansion in essential industries and the release by the Army of some men who were experienced in farm work.

The statistical evidence of the change in the supply of regular farm workers is shown in table 11. During July to October, 1942, when farm labor demands were at a seasonal peak, there was a net

TABLE 11

*Turnover in the Regular Labor Supply of 500 Farms Keeping Dairy Cows, by Type of Occupation, for the Year Ending June 30, 1943**

Item	Number of men moving						
	July Aug.	Sept. Oct.	Nov. Dec.	Jan. Feb.	March April	May June	Entire year
Men leaving farm for:							
Armed forces	4	14	15	5	1	1	40
Other farms	6	6	7	2	4	5	30
Other jobs	7	11	12	1	5	4	40
Sick or retired	—	2	2	1	6	1	12
Total left farm	17	33	36	9	16	11	122
Men coming to farm from:							
Other farms	6	5	2	7	5	11	36
Other jobs	5	1	1	8	20	8	43
Total men coming	11	6	3	15	25	19	79
Net change in no. of men	-6	-27	-33	+6	+9	+8	-43

* Does not include seasonal help hired temporarily for the summer months only.

loss of 33 regular workers from the 500 farms included in the survey. In November and December, another net loss of 33 farm workers occurred. Starting in January, however, this trend was reversed with a slight gain in agricultural workers which partially offset earlier losses. The net gain was 6 additional workers in January and February, 9 more in March and April, and 8 more in May and June.

Details concerning the age of farm workers who left or came onto the farms are shown in appendix table 8. Of the net loss of 43 men during the year, 40 per cent were under 38 years of age, 5 per cent were 38 to 44, 37 per cent were 45 to 64, and 18 per cent were 65 or more years of age.

SOURCES OF TEMPORARY LABOR

Seasonal labor was hired by the month on some farms during the growing and harvesting season. Three-fourths of such labor came from near-by farms in 1942; but only 55 per cent in 1943. School boys from villages and cities accounted for 21 per cent of the seasonal month help hired in 1942, as compared with 33 per cent in 1943. Other occupations supplied 3 per cent of the total in 1942 versus 12 per cent in 1943, including workers from the woods, near-by mills and industrial plants.

The day laborers hired in 1942 were 85 per cent from farms, 5 per cent from woodcutting, 9 per cent from mills and industrial work, and 1 per cent as boys from the city or summer camps. About 95 per cent of the day laborers came from near-by farms not over five miles distant. The remaining 5 per cent came from more distant farms, villages, or industrial centers.

Approximately one-fifth of the farmers had difficulty in 1943 in locating sufficient help for harvesting their crops. In an attempt to locate more temporary help, a number of farmers applied to the Maine Extension Service which was responsible for operating several types of farm labor programs. A few of the farmers interviewed were using Victory Farm Volunteers, which included 355 boys in Maine, mostly between 14 and 18 years of age, who left their homes during the summer to live as a member of a farm family. One farmer employed two college girls who assisted during the summer months in caring for the dairy herd. These girls

were members of the Women's Emergency Farm Service which included about 250 nonfarm girls and women who were placed on Maine farms. Other special sources of labor utilized during 1943, which helped to relieve the labor shortage, included Boy Scouts, Army and Navy Servicemen, and imported potato pickers from other states, Jamaica, and Canada. The local recruitment of young people as Crop Corps Workers for picking beans, apples, and other crops also was of considerable assistance. Many schools also co-operated in making student workers available for farm work; and many of the agricultural teachers in high schools took an active part in placing and recruiting workers. Under these farm labor programs, a total of 22,492 workers were made available on 3,836 Maine farms during 1943, of which 41 per cent were for one to three days work, 47 per cent were for four days to one month, 10 per cent were for one to five months, and 2 per cent were for over five months.¹⁰

WORK DONE BY FARM OPERATORS OFF THE FARM

About one-fifth (21 per cent) of the dairy farm operators during 1942 and 1943 did some work off the farm.¹¹ These men worked for others an equivalent of 5.3 months per man during the year, varying from one month or less for 14 per cent, two to four months for 33 per cent, five to seven months for 22 per cent, and eight months or more for 31 per cent.

One-sixth of these operators, who did outside work, were

¹⁰ Information supplied by Smith C. McIntire, State Farm Labor Supervisor, Maine Extension Service.

The United States Employment Service also assisted in the production and marketing of farm crops by recruiting and placing workers in canning factories, and in other types of industry closely associated with agricultural production.

¹¹ The information in this section does not include work exchanged with other farmers.

The 1940 Census, which includes a greater proportion of small farms than the dairy surveys, reported that 46 per cent of all farmers did some work off the farm, averaging about 5 months per farmer doing outside work. Information obtained from Agriculture, Maine, Second Series, Farm Mortgages, Taxes, Labor, Facilities, Expenditures, and Miscellaneous Farm Information, 16th Census of the United States, 1940, p. 9. Bur. of Census, U. S. Dept. Commerce.

employed by other farmers, one-third worked in the woods or did trucking, one-third worked in shipyards, mills, or factories, and one-sixth were professional workers.

Men who worked off the farm on a month basis received an average of \$143 per month, with the rate varying mostly between \$100 and \$200. Those who worked by the day using a team or truck received an average of \$10 per day, usually varying between \$8 and \$15 daily. Day rates received for man labor alone averaged \$4.63 in 1942 and \$5.50 in 1943.

The reasons why one-fifth of the farmers keeping dairy cows worked off the farm include the small size of some of the operators' farms, with a need to work out to supplement the farm income. A few farmers derived most of their income from outside work; in other cases, outside work was limited to relatively few days per year, with the operator using his team, truck, tractor, or other farm equipment at relatively high wage rates per day. Some of the farmers also were town officials or were engaged in skilled occupations that returned a higher wage rate than the cost for hiring farm labor. Consequently, it was profitable to work off the farm and hire whatever additional farm labor was needed.

WAGE RATES PAID FARM LABOR

The average wage rate paid dairy farm laborers in 1943 was \$65 per month for year or month help with board, \$80 per month without board, and \$4.00 daily for day help. The corresponding wage rates, omitting children, old folks, and others not doing a full day's work, were \$77 per month with board, \$85 per month without board, and \$4.62 per day for day help.

The hired men who worked on the large farms tended to receive a slightly higher wage rate than those who worked on the smaller farms. During 1928 to 1937, the monthly wage rate with board on the larger farms averaged \$8 more than on medium size farms and \$17 more than on small farms. Evidently the larger farmers, who utilize labor more efficiently and receive greater net returns from their farm operations, tend to share their increased returns with their hired men.

A comparison of wage rates among the five areas included in the 1943 survey indicated relatively little area differences for the

laborers living on the farm with board furnished. However, the hired workers in Cumberland and Penobscot Counties who boarded themselves received approximately \$18 more per month and 27 cents more per day than those in Waldo, Franklin, and Kennebec Counties.¹²

Day rates paid women were about one-fourth less than for men, but in piece work such as picking beans, berries, and potatoes the women earned about the same as the men. In heavier work such as haying, the women received considerably lower wages than did men.

Average day rates paid in 1943 for various types of work varied from \$2.36 for bean picking to \$3.11 for picking berries, \$3.54 for haying, \$4.37 for sweet corn picking, and \$4.80 for potato harvesting.

Board was furnished by the farmer to 80 per cent of the labor hired on an annual or monthly basis during 1942 and 1943, and to 90 per cent during the earlier years of 1928 to 1937 when the farm labor supply was larger. Dairymen's estimates of the value of board per month, in addition to that of homegrown produce, averaged \$25 in 1927-28, \$11 in 1932-34, and \$15 in 1937. In the case of day laborers, many men received only their dinners at the farm.

Farm wage rates for Maine, which are reported quarterly by the United States Department of Agriculture,¹³ usually have checked closely with those determined from dairy farm surveys. The difference in average rates from 1928 to 1937 was only 39 cents per month with board, 4 cents per month without board, and 8 cents per day for day rates. In 1943, however, the wage rates reported by the USDA for all farms in Maine averaged higher than for the 500 dairy farms included in the survey. The rates on dairy farms averaged \$3.23 less per month with board, \$17.35 less per month without board, and 17 cents less per day for day

¹² Government estimates of wage rates per month with board for October 1943 indicated an average of \$100 and over in Aroostook County, \$70 to \$79 in Southwestern Maine, and \$60 to \$69 in Central and Southeastern Maine.

Report by Louis J. Ducoff. Wages of Agricultural Labor in the United States. Mimeographed report by Bur. Agr. Econ., U. S. Dept. Agr., p. 51. September 1944.

¹³ Farm Labor Report. Bur. Agr. Econ., U. S. Dept. Agr.

help. The reason for this difference in the wartime wage rates apparently was because dairy farmers did not increase wages as rapidly as those in other types of farming.

The trend in wage rates per month with board increased from 1942 to 1943 an average of 12 per cent for dairy farms, 32 per cent for potato farms,¹⁴ 36 per cent for poultry farms,¹⁵ and 32 per cent for all farms in Maine.¹⁶ The increase in average wage rates per day during the same period was 14 per cent for dairy farms, 23 per cent for poultry farms, and 28 per cent for all farms. There obviously was a considerable lag in the upward trend of wage rates on some dairy farms. One-half of the dairy farmers who hired help on an annual basis gave no increase in wage rates from 1942 to 1943, 14 per cent paid an increase of about \$5 or \$10 per month, and the remainder paid an increase of \$15 or more per month. The average increase, for those receiving some increase in wages during 1943, was \$20 per month. New employees who were hired in 1943 received an average increase of \$27 per month above the wage rates paid the previous helpers whom they replaced. In contrast, the men who continued on the same farm from 1942 to 1943 received an average increase of only about \$7 per month.

The long-time trend in farm wage rates in Maine from 1910 to 1944, using USDA estimates, is shown in figure 5. Monthly wage rates with board in 1944 averaged \$13 per month higher than in 1943, \$53 higher than in 1940, and \$61 higher than in 1933. The 1944 rate also was \$28 more than the peak in 1920 following the first World War. Farm wage rates also were continuing to increase during 1944 and will reach somewhat higher levels in 1945. Day wage rates likewise have increased and in 1944 were 79 cents more than in 1943, \$3.12 more than in 1940, and \$1.52 more than in 1920.

¹⁴ Unpublished information from W. E. Schrupf, Maine Agr. Exp. Station, based on a survey in 1943 of 241 potato farms in Maine.

¹⁵ Perry, Alvah L. Farm Labor on Maine Poultry Farms. Maine Agr. Exp. Sta. Misc. Publication 597, p. 10. December 1944.

¹⁶ Same as footnote 13. A dairy farm survey in New York also showed an increase in month rates with board of only 10 per cent from 1942 to 1943, which was much less than for all farms. Farm Economics, p. 3604. Cornell University, June 1944. Also see footnote 12 for additional evidence for Maine.

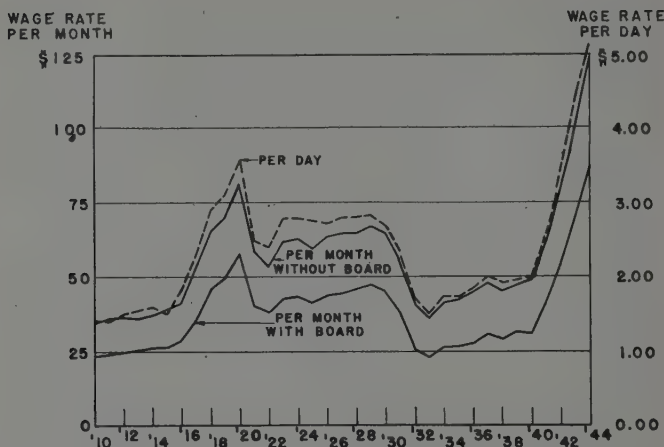


FIG. 5. Trend in Farm Wage Rates in Maine from 1910 to 1944. Wage rates have increased rapidly since 1940 and are above the high points reached in World War I. The information is based on data from Farm Labor Reports, Bur. Agr. Econ., U. S. Dept. Agr., which is summarized in Appendix Table 9.

FACTORS AFFECTING LABOR EFFICIENCY AND THEIR RELATION TO LABOR INCOME

Average Labor Efficiency

The average size of dairy farms in Maine has been relatively small, resulting in rather low labor efficiency. For 989 farms included in the dairy surveys made during 1928 to 1937, there was an average per farm of 10 cows, 49 acres of crop land, and 378 man work units (table 12).

Milk production per cow in Maine, for the 1928-37 surveys, averaged 4,983 pounds of milk annually, in terms of milk testing 4.0 per cent butterfat. The labor requirement in caring for cows was 3.8 hours per cwt. of milk produced.

The average labor efficiency for these farms was only 5.8 cows per man equivalent, 28 acres of crops per man, or 215 man work units per man. The latter figure indicates that the average amount of productive work accomplished by an able-bodied man was equiva-

lent, under normal conditions, to only 215 ten-hour days during the year. This low figure does not mean that dairy farmers as a group did not work long hours, but indicates that many were handicapped with small herds, relatively little labor-saving equipment, and poor farm organization, so that the amount of productive work accomplished per man was low.

A comparison of the labor efficiency on Maine dairy farms with that in other areas shows 215 productive man work units per man for Maine, 211 for Rhode Island, 225 for New York, 231 for New Hampshire, 258 for Pennsylvania, and 281 for Vermont (Appendix table 22). The dairymen included in the Vermont survey had the advantage of larger herds, averaging 20 cows per herd as compared with 10 in Maine.

The average labor income per farm operator was +\$263 during 1927-28; was a loss of \$175 during the depression years of 1932-34; and was a gain of \$164 in 1936-37 (table 12). These

TABLE 12

*Average Labor Efficiency and Size of Business for 989 Dairy Farms
Included in Surveys During 1928 to 1937*

Item*	1928 survey of 178 farms	1933-34 surveys of 513 farms	1937 survey of 298 farms	1928-37 surveys of 989 farms
Labor efficiency:				
Man work units per man†	243	206	210	215
Cwt. of milk per man	296	295	277	290
No. of cows per man	5.7	6.1	5.4	5.8
Animal units per man‡	10.4	9.8	9.0	9.7
Crop acres per man	30	28	28	28
Hours of labor per cwt. of milk	3.1	4.1	3.7	3.8
Size of business per farm:				
Number of cows	10.9	10.5	9.3	10.2
Acres of crops	57	48	48	49
Total man work units†	467	355	362	378
Pounds of milk per cow§	5191	4820	5157	4983
Labor income per farm	+\$263	-\$175	+\$164	+\$ 5

* For more details by areas, see Appendix Table 10.

† A man work unit is the average amount of productive work accomplished by an able-bodied man in a ten-hour day under average farm conditions using customary farm equipment.

A man equivalent represents 12 months of farm work, adjusted for the work accomplished by an able-bodied man.

‡ An animal unit is one cow or horse, or the equivalent for other livestock on the basis of the amount of feed consumed and manure produced.

§ Milk production is expressed in terms of milk containing four per cent butterfat, with allowance for both the butterfat and skimmilk content.

|| Labor income is the operator's return for his year's work in addition to the use of a dwelling and farm products used in the home. Farm expenses include charges for interest at five per cent on the average farm capital, and labor furnished by the farm family other than the operator.

figures represent the operator's return for his labor and management after charging a reasonable wage rate for use of unpaid family labor (averaging \$197 per farm in 1937), and an interest charge on all farm capital at the rate of 5 per cent (amounting to \$309 per farm in 1937). In addition to labor income, the operator also received the use of a house and products grown on the farm for family use, which in 1937 amounted to \$351 per farm.

Variation in Labor Efficiency

The degree of labor efficiency among individual farms varied considerably due to many factors, including size of the farm business, productivity of crops and livestock, use of machinery and equipment, and age of the operator. At one extreme, there were 15 per cent of the farmers with less than 150 man work units per man. At the other extreme, there were 13 per cent with 300 or more man work units per man. The more efficient dairymen had much larger farm businesses, but employed no more labor than did the inefficient farmers (table 13). The most efficient group, using only 1.7 men per farm, kept an average of 14.4 cows and accomplished a total of 589 man work units per farm. The least efficient group, using 1.8 men per farm, had only 6.6 cows and 217 man work units per farm. The effects of more efficient labor utilization, along with a larger business, resulted in a decrease of 18 cents per cwt. in the cost of milk production and an increase in labor income per farm from a loss of \$406 to a gain of \$394.

TABLE 13

*Relation of Labor Efficiency to Size of Business and Labor Income Per Farm, for 989 Farms in Dairy Surveys 1928 to 1937**

Average man work units per man	No. of cows per farm	No. of men equiv. per farm	Total man work units per farm	Number of cows per man	Cwt. cost of milk production	Labor income per farm
100-149	6.6	1.8	217	3.7	\$2.39	-\$406
150-174	8.7	1.9	304	4.7	2.25	- 181
175-199	9.3	1.8	333	5.2	2.24	- 48
200-224	10.3	1.8	380	5.7	2.23	- 60
225-249	11.3	1.8	419	6.4	2.13	+ 137
250-299	12.0	1.7	452	7.2	2.16	+ 220
300 or more	14.4	1.7	589	8.7	2.21	+ 394

* For more details, see Appendix Table 11. For a definition of terms used, see footnotes below table 12.

The effect of differences in labor efficiency on labor income for farms of the same size is shown in table 14. During years of reasonably good prices (1928 and 1937), an advance in labor efficiency caused labor income per farm on the small farms to advance from $-\$194$ to $+\$90$, and on the large farms from $-\$279$ to $+\$919$.

In years of low prices, labor efficiency also was important, but the additional production per man did not cause as much increase in returns. In 1933-34, on the large farms with low labor efficiency, there was a loss of $\$421$ per farm, in contrast with a gain of $\$24$ for the farms with high labor efficiency.

TABLE 14

Relation of Labor Efficiency to Labor Income, with Farms Grouped According to Size, for 989 Farms in Dairy Surveys 1928 to 1937

Labor efficiency, measured by man work units per man*	Size of farm, measured by total man work units per farm†		
	Small farms	Medium farms	Large farms
1933-34 surveys:			
Low efficiency	$-\$255$	$-\$372$	$-\$421$
Medium efficiency	$- 180$	$- 187$	$- 443$
High efficiency	$- 84$	$- 76$	$+ 24$
1928 and 1937 surveys:			
Low efficiency	$-\$194$	$-\$323$	$-\$279$
Medium efficiency	$+ 91$	$+ 57$	$+ 280$
High efficiency	$+ 90$	$+ 274$	$+ 919$

* The man work units per man were 100 to 174 for low efficiency, 175 to 224 for medium efficiency, and 225 or more for high efficiency.

† The man work units per farm were 100 to 299 for small farms, 300 to 499 for medium farms, and 500 or more for large farms.

Relation of Size of Farm Business to Labor Efficiency and Labor Income

There are several measures of the size of a farm business, including number of cows, number of animal units, acres of crop land, number of men equivalent, and farm capital. The most inclusive measure, however, is total man work units per farm. The largest farms with 600 or more man work units had an average of 287 man work units accomplished per man, as compared with only 127 man work units per man on the smallest farms (table 15). The farmers with the largest business used only 3.1 hours of

labor per cwt. of milk, and produced milk at a net cost of only \$2.06 per cwt. In contrast on the smallest farms, 5.0 hours of labor were required, and the net cost of production was \$2.38 per cwt. The average labor income varied from a loss of \$257 on the smallest farms to a gain of \$577 on the largest farms.

The variation in number of cows or total animal units per farm also showed a similar effect (as did man work units) on labor efficiency and labor income (table 15). Consequently the upward trend in Maine in the size of dairy herds is an important factor in improving the efficiency of milk production. The 1940 Census indicates that the number of milk cows in Maine from 1930 to 1940 had increased 26 per cent in the herds of 20 or more cows, as compared with a 9 per cent increase in herds of 10 to 19 cows, and a decrease of 17 per cent in herds of less than 10 cows.¹⁷ Further evidence of this trend is shown in the volume of milk delivered per dairyman in Maine for the Boston market. The percentage increase was 41 per cent from 1932 to 1940, and another 42 per cent from 1940 to 1944.¹⁸

Acres of crop land and farm capital also showed a somewhat similar relationship, but did not give as close a correlation with labor income as did the other factors. Crop acres were not always a satisfactory measure of size on these dairy farms because of the variations in crop yields, especially with the existing large acreage of low yielding hay land on some farms. Farm capital also was not always a good measure of size of business because land, buildings, and equipment sometimes were not used to capacity, or were valued at too high or too low a figure.

The number of men equivalent per farm did not appreciably affect labor efficiency or labor income because of the wide variation in the productive use of labor. On many farms where additional labor was used, the size of the farm business was not increased to a corresponding degree, and no increase occurred in labor efficiency or labor income.

The efficient use of labor on a small farm is considerably

¹⁷ Computed from *Agriculture, Cows Milked, and Dairy Products*, 16th Census of the United States, 1940, pp. 42-44. Bureau of Census, U. S. Dept. Commerce.

¹⁸ Dow, George F. *The Dairy Situation, Farm Economic Facts*. A mimeographed report, Dept. Agr. Econ. and Farm Mgt., University of Maine, p. 1266. January 1945.

TABLE 15

*Relation of Size of Farm Business to Labor Efficiency and Labor Income
for 989 Farms in Dairy Surveys 1928 to 1937**

Measures of size of farm business	Average man work units per man	Cwt. of milk per man	Hours of labor per cwt. milk	Cwt. cost of milk production	Labor income per farm
Total man work units per farm:					
100-199	127	210	5.0	\$2.38	-\$257
200-299	180	261	4.4	2.34	- 75
300-399	206	292	3.8	2.20	- 39
400-499	226	282	3.8	2.30	- 50
500-599	242	325	3.5	2.16	- 8
600 or more	287	349	3.1	2.06	+ 577
Number of cows per herd:					
Less than 6	156	173	5.4	2.51	- 95
6-7	189	235	4.4	2.37	- 3
8-9	201	264	4.0	2.29	+ 6
10-12	230	303	3.7	2.18	+ 41
13-15	235	326	3.4	2.15	+ 97
16 or more	262	411	3.2	2.08	+ 36
Number of animal units per farm:					
Less than 10	151	209	4.8	2.40	- 116
10-12	188	238	4.4	2.34	- 23
13-15	199	268	4.1	2.36	- 54
16-18	218	289	3.7	2.22	+ 55
19-21	223	302	3.7	2.20	+ 45
22 or more	259	359	3.3	2.09	+ 120
Acreage of crops per farm:					
Less than 30	165	246	4.4	2.30	- 75
30-39	205	283	4.0	2.20	+ 44
40-49	215	288	3.8	2.17	+ 35
50-59	221	304	3.6	2.18	- 31
60-69	225	320	3.6	2.17	+ 65
70 or more	245	304	3.6	2.24	+ 101
Number of men equivalent per farm:					
Less than 1.2	229	322	4.4	2.37	+ 10
1.2-1.4	214	295	4.2	2.24	+ 9
1.5-1.7	226	293	4.0	2.32	+ 27
1.8-2.0	207	270	3.6	2.17	+ 61
2.1-2.3	210	299	3.6	2.17	- 6
2.4 or more	210	273	3.4	2.07	- 26
Farm capital per farm:					
Less than \$4000	168	233	4.7	2.20	- 46
4000-4999	196	255	4.4	2.35	- 103
5000-5999	212	293	3.8	2.26	+ 36
6000-7999	223	291	3.9	2.26	0
8000-9999	222	308	3.4	2.16	+ 7
10,000 or more	263	348	3.1	2.14	+ 124

* For more details for each group above, see Appendix Tables 12 to 17. For a definition of terms used, see footnotes below table 12.

more profitable than the inefficient use of labor on a large farm, as shown in table 14. During 1928 and 1937, the efficient dairy-men on small farms received an average labor income of +\$90 per farm, whereas the inefficient producers on the large farms

had an average loss of \$279 per farm. During 1933 and 1934 when prices were low, the small farms with high labor efficiency had a loss of only \$34 per farm as compared with a loss of \$421 on the large farms with low labor efficiency.

The farms that paid best, except possibly in periods of abnormally low prices, were the larger farms with high labor efficiency. In the 1928 and 1937 surveys the farms with high labor efficiency had an average labor income of +\$90 per small farm, +\$274 per medium farm, and +\$919 per large farm.

Relation of Farm Productivity to Labor Efficiency and Labor Income

High milk production per cow is an extremely important factor in the efficient use of labor. As the milk production per

TABLE 16

*Relation of Milk Production Per Cow and Crop Yields to Labor Efficiency and Labor Income for 989 Farms in Dairy Surveys 1928 to 1937**

Rate of productivity	Average man work units per man	Cwt. of milk per man	Hours of labor per cwt. milk	Total work units per farm	Net cost production cwt. milk	Labor income per farm
Pounds of milk per cow annually:						
Less than 4000	228	203	5.6	376	\$2.83	-\$158
4000-4999	214	270	4.2	388	2.37	+ 6
5000-5999	210	308	3.4	365	2.07	+ 20
6000-6999	213	383	3.0	375	1.93	+ 142
7000 or more	199	377	2.7	390	1.80	+ 318
Index of crop yields:†						
Less than 80	214	261	4.3	344	2.34	- 155
80-89	190	244	4.2	321	2.27	- 179
90-99	215	283	3.7	374	2.17	- 44
100-109	227	306	3.6	406	2.17	+ 96
110-119	212	287	3.8	390	2.24	+ 185
120 or more	223	342	3.4	429	2.14	+ 203
Index of farm productivity:‡						
Less than 80	210	208	5.6	360	2.84	- 305
80-89	221	239	4.6	384	2.49	- 52
90-99	218	271	4.1	366	2.32	- 25
100-109	211	297	3.5	381	2.11	+ 38
110-119	208	327	3.2	381	2.03	+ 203
120 or more	211	400	2.9	399	1.87	+ 330

* For more details for each group above, see Appendix tables 18 to 20. For a definition of terms used, see footnotes below table 12.

† The index of crop yields is a measure of the productivity of crops, weighted on the basis of man work units, and expressed as a percentage of the average crop yields for all farms included in the study.

‡ The index of farm productivity is a measure combining milk production per cow and the index of crop yields, weighted on the basis of man work units, and expressed as a percentage of the average productivity for all farms.

cow increased from less than 4,000 pounds annually to 7,000 pounds or more, the labor requirements for producing 100 pounds of milk decreased from 5.6 to 2.7 hours (table 16). This reduction of one-half in labor requirements, along with more efficient use of feed and other factors, resulted in a decrease in milk production costs from \$2.83 to \$1.80 per cwt. of milk. Labor income increased from a loss of \$158 to a gain of \$318 per farm.

High crop yields had a similar effect upon the efficient use of labor and the operator's returns. As crop yields increased from an average of 30 per cent below normal to 34 per cent above normal, the volume of crop production per man was doubled.

Crop yields and milk production per cow also were combined as a measure of farm productivity. The farmers with the highest rate of productivity obtained 70 per cent more production per man (of milk and crops combined) than did those with lowest productivity. Labor income was a gain of \$330 per farm in the former group as compared with a loss of \$305 in the latter group (table 16).

Relation of Specialization in Dairying to Labor Efficiency and Cost of Milk Production

The farmers who specialized in dairying produced milk the most efficiently, with less labor required per cow and with a lower cost of milk production. On the larger farms, for example, the dairymen with the greatest dairy specialization used only 162 hours of labor annually in caring for a cow. In contrast, those with the least specialization in dairying required 196 hours per cow (table 17). The net cost of milk production was \$2.14 per cwt. on the most specialized farms as compared with \$2.43 on the least specialized farms.

One would assume that with the above economies, the specialized dairy farmers would have accomplished more man work units per man and would have had a higher labor income per farm. On some farms, however, the specialized dairymen did not make effective use of the time saved in doing dairy chores. Such dairymen had more leisure time but did not have an increase in labor income unless they increased the size of their herd or some other phase of the farm business, or reduced the amount of hired farm labor. However, when the savings in labor doing

chores resulted in keeping more cows, thus increasing the size of farm business, a substantial increase occurred in man work units per man and in labor income. Also, if an increase were made possible in some other farm enterprise, without changing the size of the dairy herd, labor would be used more efficiently and the labor income would be increased. In general, the dairy-men with one or more important supplementary farm enterprises were using farm labor more efficiently and obtaining greater farm incomes than those who specialized in dairying.

TABLE 17

*Relation of Extent of Specialization in Dairying to Labor Efficiency, Net Cost of Milk Production and Labor Income, for 989 Farms in Dairy Surveys 1928 to 1937**

Item	Per cent of man work units per farm used for dairy herd			
	Less than 40	40 to 49	50 to 59	60 or more
Hours of labor per cow annually:				
Small farms	236	245	227	214
Medium farms	210	201	179	169
Large farms	196	153	159	162
Cwt. cost of milk production for all farms	\$2.43	\$2.22	\$2.22	\$2.14
Man work units per man:				
Small farms	185	167	163	157
Medium farms	222	215	201	223
Large farms	285	268	253	261
Labor income per farm:				
Small farms	-\$ 25	-\$ 60	-\$150	-\$187
Medium farms	+ 194	+ 13	- 152	- 182
Large farms	+ 605	+ 177	+ 124	0

* For more details see Appendix table 21.

For a definition of terms used, see footnotes below table 12.

Small farms had 100 to 299 man work units per farm, medium farms had 600 to 499, and large farms had 500 or more. *

Relation of Use of Machinery to Labor Efficiency

Most dairymen with relatively large herds use considerable machinery and equipment. More mechanization, where practical, saves man labor or makes possible a larger farm business thereby increasing the operator's labor income. The extent to which dairymen have mechanized is shown in a recent Station Bulletin.¹⁹

¹⁹ Dow, George F. Use of Machinery and Horses on Maine Farms Keeping Dairy Cows. Maine Agr. Exp. Sta. Bul. 429. 1944.

This report also indicates a tendency on the larger farms for a considerable further increase in use of machinery as new equipment becomes available. Two recent developments are speeding up this trend. One is the increase in the average size of Maine dairy herds. The other is the rapid rise in farm wage rates and the scarcity of available labor. Increased mechanization is undoubtedly an economical investment on many of the farms with a large volume of production. However, before investing in equipment, dairymen should estimate the additional cost of the investment and the operating expenses for such equipment, and compare these costs with the savings in hired labor, and the additional income from an increase in the size of the farm business and the improvement in quality resulting from machinery use.

Milking machines in 1943 were used by none of the farmers with less than 5 cows, but by 84 per cent of those having 20 or more cows. New milking machines also were desired by one-third of those who were hand milking 15 or more cows, by one-fourth of those milking 10 to 14 cows, and by 6 per cent of those with 5 to 9 cows. The use of milking machines in herds of over 10 cows saved an average of 24 hours of man labor per cow annually, amounting to a reduction of one-fourth in milking time. This saving is equivalent to one hour daily in a herd of 15 cows.

The amount of labor saved by using manure spreaders is not known, but they are used extensively. About two-thirds of the dairymen with herds of 10 to 14 cows use manure spreaders. In herds of 15 to 19 cows, the percentage was 71 per cent and for 20 or more cows 87 per cent.

Hay loaders were used in 1943 by only one-half of the dairymen with 20 or more cows and by slightly less than one-fifth of those with 10 to 19 cows. New hay loaders and side delivery rakes were desired on about one-fifth of the larger farms where hay was pitched on by hand. Hay loaders saved an average of 17 minutes in the time required for getting in a ton of hay, resulting in a total labor saving of 34 minutes per ton for a two-man crew. Buck rakes are a new type of equipment that appear to save considerable labor under ideal conditions. Efficient methods in harvesting hay are important, not only in saving labor, but in making possible improved quality of the hay.

Water was available for 30 per cent of the herds either in individual drinking cups or from a trough directly in front of the

cows. Such watering equipment in a herd of 10 cows saves an average of approximately 40 minutes a day as compared with turning cows loose to be watered at a tub or watering from pails. When water is available to cows at all times, there is not only a saving in labor but a higher milk production per cow.

Relation of Age of Operator to Labor Efficiency and Labor Income

Labor efficiency was affected considerably by the age of the farm operator. Operators that were less than 40 years of age averaged 236 man work units per man, as compared with 218 units for operators 40 to 49 years old, about 200 units for men 50 to 64 years old, and only 186 units for those that were 65 or more years of age (table 18). There was relatively little difference among the operators of various age groups in the crop acreage per farm, number of men per farm, milk production per cow, and productivity of crops. The chief difference was in the number of cows per herd, which was approximately two less on farms operated by men 65 or more years of age.

The younger farm operators, who used labor more efficiently than the older men, had an average labor income of +\$177 per farm as compared with -\$208 for the older operators 65 or more years of age.

TABLE 18

Relation of Age of Operator to Labor Efficiency and Labor Income for 989 Farms in Dairy Surveys 1928 to 1937

Item*	Age of operator					
	Less than 40	40-49	50-54	55-59	60-64	65 or more
Number of operators	114	173	137	115	140	132
Man work units per man	236	218	203	203	200	186
Hours labor per cwt. milk	3.8	3.6	4.1	4.0	4.1	4.5
Cwt. milk per man	312	311	273	281	293	254
Number cows per farm	10.8	10.6	9.8	10.8	10.0	8.5
Crop acres per farm	49	48	48	49	46	47
Total man work units per farm	395	387	354	380	337	294
Number men equiv. per farm	1.7	1.8	1.7	1.9	1.7	1.6
Per cent of work on dairy	51	52	53	54	55	56
Milk production per cow	4853	5226	4887	4872	4910	4702
Index of crop yields	97	104	99	101	101	99
Net cost per cwt. milk	\$1.96	\$1.95	\$2.01	\$2.00	\$1.99	\$2.15
Labor income per farm:						
1933-34	-\$ 31	-\$164	-\$182	-\$225	-\$178	-\$296
1937	+ 481	+ 224	+ 78	+ 317	+ 131	- 69
All surveys	+ 177	- 11	- 76	- 7	- 57	- 208

* For a definition of terms used, see footnotes below tables 12 and 16.

EXPERIENCE AND EDUCATION OF FARM OPERATORS

Dairy farm operators were an average of 53 years of age, and had occupied their present farms an average of 20 years, according to dairy farm surveys made during 1933 to 1937. The latter figure compares closely with the average of 18 years of occupancy for all farm operators in Maine, as reported in the 1940 Census.²⁰ Approximately two-thirds of the operators had been on the present farm for ten or more years, 15 per cent for five to nine years, and 18 per cent for less than five years. In addition to long experience on the present farm, about one-fifth of the dairy farmers had owned another farm prior to the present one, making an average of 23 years experience as farm operator.

The average age when dairymen began to operate their own farms was 30 years. Only 3 per cent became owners when less than 20 years of age, 25 per cent when 20 to 24 years, 24 per cent when 25 to 29 years, 21 per cent when 30 to 34 years, and 27 per cent when 35 or more years of age.²¹

Prior to farm ownership, the operators worked elsewhere for an average of 12 years at various occupations, starting fulltime work at the average age of 18.5 years. The type of employment for two-thirds of the men, preceding farm ownership, was primarily farming either on the home farm or working as hired man on another farm. The remaining one-third engaged in nonfarm occupations, including 9 per cent who worked in factories, shops, or mills, 7 per cent in transportation as railroad, trolley car, ship, teamster, or trucker, 5 per cent in teaching or office work, 3 per cent as woodsman or lumberman, 3 per cent as carpenter or painter, 3 per cent as machinist, blacksmith, or quarry worker, 2 per cent as salesman or store worker, and 1 per cent in engineering.

Only about four per cent of the dairymen included in the 1937 survey started farming as tenants, at an average age of 29 years. They became farm owners six years later at the average age of 35 years.

²⁰ Agriculture, Maine, Second Series, Farm Mortgages, Taxes, Labor, Facilities, Expenditures, and Miscellaneous Farm Information, 16th Census of the United States, 1940, p. 10. Bur. of Census, U. S. Dept. Commerce.

²¹ More details for the older age group include 11 per cent for 35-39 years, 12 per cent for 40-49 years, and 4 per cent for 50 or more years of age.

The farms owned by the dairymen interviewed between 1928 and 1937 were inherited by 39 per cent of the total operators, and were purchased by the remaining 61 per cent. The average age of assuming farm ownership was about 30 years, whether acquiring by inheritance or by purchase.

The education of nearly two-thirds of the dairy farm operators interviewed during 1928-37 was limited to grammar school. Only 31. per cent received any high school education, 4.2 per cent attended business or normal school, and 2.4 per cent attended college.²² In recent years, however, there has been a considerable increase in the proportion of young men attending high school and obtaining additional education. Of the operators under 40 years of age, 45 per cent attended two or more years of high school, and 4.3 per cent went to college for two or more years. The corresponding figures for operators 60 years or more of age were only 17 per cent attending high school, and none attending college (table 19).

TABLE 19

*Relation of Age of Farm Operator to the Amount of
Advanced Education Received for 989 Farmers in
Dairy Surveys 1928 to 1937*

Age of operator in years	Proportion of total operators having	
	2 or more years of high school	1 or more years of business, normal school, or college
Under 40	45	4.3
40-49	36	2.9
50-59	28	.8
60 or more	17	—
All operators	28	1.4

The farm operators who extended their education beyond grammar school obtained larger returns from their farms. During

²² The 1940 Census for Maine showed that 32 per cent of the total rural male population attended high school, and 4.5 per cent attended college for at least two years. For the entire male population in Maine, 35 per cent attended high school, and 8.3 per cent attended college. Information obtained from Population, Second Series, Characteristics of the Population, Maine, 16th Census of the United States, 1940, p. 25. Bur. of Census, U. S. Dept. Commerce.

1928 and 1937, the average labor income per farm was +\$144 for those who attended grammar school only, +\$277 for those who also had some high school education (but no college work), and +\$451 for those who went to college, normal school, or business school. During 1933 and 1934, when prices were abnormally low, the farmers with advanced education also benefited by having smaller losses per farm. The average labor income per farm for all four surveys was -\$29 for grammar school only, +\$53 for high school, and +\$114 for college or other advanced education (table 20).

TABLE 20

*Relation of Education to Labor Income Per Farm,
for 989 Farmers in Dairy Surveys 1928 to 1937*

Amount of education obtained	Average labor income per farm		
	1928, 1937 surveys	1933, 1934 surveys	All four surveys
Grammar school only	+\$144	-\$193	-\$29
Some high school, but no college	+ 277	- 157	+ 53
College, or other education beyond high school	+ 451	- 120	+ 114

SUMMARY

The labor shortage on Maine dairy farms has been an acute problem. On many farms, however, most of the labor is furnished by the owner and his family, and production has been well maintained by various methods in spite of severe difficulties.

The average amount of labor used per farm was about 22 months per farm annually. During 1942-43, the farm operator accounted for 49 per cent of the labor, his family an additional 31 per cent, hired year and month help 15 per cent, and hired day help 5 per cent. The number of unpaid family workers who furnished some farm labor averaged 1.26 persons per farm.

Although only 20 per cent of the labor was hired, 70 per cent of the dairy farmers in 1943 were dependent on some hired help. Labor was hired in 1943 on an annual basis by 18 per cent of the farmers, on a monthly basis by 12 per cent, and on a day basis by

62 per cent. Hired day labor was used on 18 per cent of the farms for planting, on 20 per cent for sweet corn picking, on 6 per cent for bean picking, on 2 per cent for berrying, on 34 per cent for haying, and on 13 per cent for potato harvesting. In addition to hiring labor, about one-third of the farmers exchanged work with neighbors in order to use labor and equipment more efficiently.

The assistance of women on farms has been of material help in maintaining agricultural production. In 1943, women and girls accounted for about 12 per cent of all labor used on dairy farms, including 14 per cent of the family labor, 1 per cent of the hired year or month help, and 11 per cent of the hired day help. Women did about three-fourths of the hired day labor in berrying, one-half for bean picking, one-tenth for sweet corn picking and potato harvesting, and 2 per cent for haying. The women did 12.5 per cent of the hired day labor in 1943 as compared with 10.0 per cent in 1942. There was no appreciable change, however, in the farm use of women as unpaid labor or women hired on a month basis.

Many farm laborers are of draft age, so that production would be materially affected except for deferments. Thirty-one per cent of the men in the farm labor supply were aged 18 to 37, 12 per cent were under 18, 27 per cent were 38 to 54, and 30 per cent were 55 or more years of age. Men that were 18 to 25 years of age included 12 per cent of the total.

The average ability of laborers to do a full day's work was 90 per cent for men and boys, and 76 per cent for women and girls. The working ability of children under 14 years of age averaged 50 per cent in comparison with 88 per cent for young men and boys 14 to 17 years of age, about 99 per cent for men aged 18 to 54, and 68 per cent for men 65 or more years of age.

There has been no marked change in the efficiency or working ability of farm labor, with a decrease only from 88.67 to 88.02 per cent during 1942-43. The decrease averaged only 0.3 per cent for family farm labor, but 4.8 per cent for hired day help. The combined reduction in the ability of labor to do the work of an able-bodied man and in the decrease of 1.8 per cent in the months of labor used on farms resulted in a total decrease of 2.6 per cent in months of able-bodied man labor per farm. In spite of this decrease, however, there was a net increase of about 5 per cent in the production of crops and livestock on these dairy farms. The increase in output per month of farm labor was 8.1 per cent. This

was accomplished by working more hours per day, more days per week, more use of machinery, and the postponement of repairs and improvements.

The importance of providing a seasonal supply of labor, in addition to year round help, is indicated by the fact that 50 per cent more labor is used monthly during July, August, and September than in the winter period.

The deferment of agricultural workers under amendments to the Selective Service Act, effective late in 1942, was of major importance in maintaining production. Prior to these amendments, farms were being rapidly depleted of agricultural workers with a net loss of 66 workers from 500 dairy farms during July to December, 1942. After January 1, 1943, this trend was reversed with a net gain of 23 workers during January to June. Of all men who left the farms, one-third entered the armed forces, one-fourth went to other farms, and 42 per cent went into other types of work.

Although farm labor programs have done considerable to make city labor available on farms, most of the seasonal labor on dairy farms continues to come from near-by sources. About 95 per cent of the day help came from near-by farms not over five miles distant, with only 5 per cent from more distant farms, villages, and industrial centers. Of the seasonal labor hired by the month, only 55 per cent, however, was from near-by farms in 1943 as compared with three-fourths in 1942. About one-fifth of the farm operators did some work off the farm.

Average wage rates for an able-bodied man on Maine dairy farms in 1943 were \$77 per month with board, \$85 per month without board, and \$4.62 for day help. Wage rates on dairy farms have lagged behind those paid by potato and poultry producers. The average wage rate for Maine in 1944 was \$53 more per month without board than in 1940, and \$28 higher than the peak rate in World War I.

The efficiency in the use of labor is relatively low on many dairy farms because of the small size of farm business, low rates of production, and a lack of labor-saving equipment. The average labor efficiency per man equivalent, for 1928 to 1937 surveys, was only 5.8 cows per man, or a total of 215 man work units per man. The dairymen with the most efficient use of labor averaged 1.7 men per farm, kept 14.4 cows, and had a labor income of

+\$394 per farm. The least efficient, with 1.8 men per farm, kept only 6.6 cows and had a labor income of —\$406 per farm.

The farmers with the highest crop yields and largest milk production per cow produced 70 per cent more food per man, and had a labor income of +\$330 per farm, as compared with —\$305 for the least productive farmers.

Milking machines, buck rakes, and watering cups were some of the types of equipment that resulted in more efficient use of labor.

The farmers who supplemented dairying with some other farm business used labor more efficiently and had a larger labor income than those who specialized in dairying.

The operators who were 65 or more years of age accomplished an average of only 186 man work units per man as compared with 236 units of production on farms where the operators were less than 40 years of age.

Dairy farm operators were an average of slightly over 50 years of age. They had occupied their present farms for an average of 20 years. Prior to owning a farm, two-thirds worked on other farms and one-third were engaged in nonfarm occupations. The education of nearly two-thirds of the farm operators was limited to grammar school; but an increasing proportion of the younger men had been to high school and college.

APPENDIX TABLE 1

*Average Number of Dairy Cows Per Herd, Acreage Per Farm, and Use of Labor, for 989 Farms in Dairy Surveys Made Between 1928 and 1937**

Item	1928 survey	1933 survey	1934 survey	1937 survey	All surveys 1928-37
Number of farms	178	255	258	298	989
No. of cows per herd	10.9	9.1	12.0	9.3	10.2
Acreage per farm:					
Total cropland	57	49	46	48	49
Cleared pasture land	62	40	40	55	49
Woodland	90	67	65	67	71
Miscellaneous	6	3	1	4	3
Total acres	215	159	152	174	172
Per cent of cropland in hay	72	79	82	74	77
Total months of labor per farm annually	23	19	22	21	21
Per cent of labor for:					
Dairy cows	40	47	54	44	46
Other dairy cattle	4	4	4	4	4
Other livestock	6	7	5	6	6
Crops	32	33	27	34	32
Miscellaneous	18	9	10	12	12
Total	100	100	100	100	100
Total man work units per farm	467	330	380	362	378
Av. man work units per man	244	209	204	210	215
Lbs. milk per cow annually	5191	4557	5017	5034	4950
Av. expense per farm for labor†	\$838	\$265	\$366	\$396	\$437
Labor as percentage of all farm expenses‡	32	26	24	25	27
Labor as percentage of milk production costs‡	35	35	24	§	31§

* The 1928 and 1943 surveys covered several different sections in the general dairy farming area of Maine; the 1933 survey was in Waldo and Knox Counties; the 1934 survey was in the vicinities of Farmington and Portland; and the 1937 survey was in Central and Western Maine. There was an average of 10.9 cows per herd in the 1943 survey.

† Includes cost for hired labor and the value of unpaid family labor used for farm work, other than the farm operator.

‡ Includes the value of all labor, including that of farm operator.

§ Complete milk production costs were not available in the 1937 survey.

APPENDIX TABLE 2

*Per Cent of Total Rural Farm Population in Maine,
by Age Groups, in 1940**

Age	Per cent of total		
	Males	Females	All persons
Under 10	17	19	18
10 - 19	20	20	20
20 - 29	13	12	13
30 - 39	11	11	11
40 - 49	11	12	11
50 - 59	11	11	11
60 - 69	10	9	9
70 or more	7	6	7
Total	100	100	100

* Population, Second Series, Characteristics of the Population, Maine, 16th Census of the United States, 1940, pp. 17, 29-31. Bur. of Census, U. S. Dept. Commerce.

APPENDIX TABLE 3

*Employment of Rural Farm Population in Maine, 14 Years Old and Over,
in 1940**

Type of employment	Number of persons			Per cent of total 14 years old and over		
	Male	Female	All persons	Male	Female	All persons
Farmers	20,482	619	21,101	30.7	1.1	17.1
Farm laborers for wages	6,753	65	6,818	10.1	.1	5.5
Unpaid farm laborers	2,170	110	2,280	3.3	.2	1.9
Total farm labor	29,405	794	30,199	44.1	1.4	24.5
Other persons with jobs	22,168	7,684	29,852	33.2	13.6	24.3
Own housework	387	36,557	36,944	.6	64.8	30.0
In school	6,110	5,744	11,854	9.2	10.2	9.6
Unable to work	5,379	3,499	8,878	8.1	6.2	7.2
Others and not reporting	3,193	2,163	5,356	4.8	3.8	4.4
Total 14 years old and over	66,645	56,441	123,086	100.0	100.0	100.0

* Population, Second Series, Characteristics of the Population, Maine, 16th Census of the United States, 1940, pp. 17, 29-31. Bur. of Census, U. S. Dept. Commerce.

APPENDIX TABLE 4

Age of Operators on Maine Farms

Age	Per cent of total farm operators		
	1940 Census*	1933-37 surveys	1943 survey
Under 25	1	1	2
25 - 34	9	6	14
35 - 44	18	16	18
45 - 54	24	29	23
55 - 64	24	30	26
65 or more	24	18	17
Total	100	100	100
Av. age	54	53	51

* Agriculture, Maine, Second Series, Farm Mortgages, Taxes, Labor, Facilities, Expenditures, and Miscellaneous Farm Information, 16th Census of the United States, 1940, p. 10. Bur. of Census, U. S. Dept. Commerce.

APPENDIX TABLE 5

Variation in Age of Day Help Hired on 500 Farms in 1942, by Farm Enterprises

Age	Per cent of total days hired						
	Bean picking	Berry picking	Haying	Sweet corn	Potato digging	All day help	Worked by women and girls
Under 14	34	27	10	8	—	9	16
14 - 17	52	17	19	13	18	22	20
18 - 25	3	11	10	15	5	8	7
26 - 37	7	8	19	34	22	19	28
38 - 44	2	16	13	19	37	19	17
45 - 54	1	21	13	5	5	10	11
55 - 64	1	—	13	5	12	10	1
65 or more	—	—	3	1	1	3	—
Total	100	100	100	100	100	100	100

APPENDIX TABLE 6

*Changes in the Production of Crops and Livestock From 1942 to 1943,
for 490 Farmers Keeping Dairy Cows on the Same Farms During
the Two-Year Period*

Farm enterprise	Total number of farms		Change in acreage or number of livestock per farm that		Total net change for 490 farms
	Increased prod.	Decreased prod.	Increased	Decreased	
Potatoes	108	19	3.3	2.6	306
Sweet corn	128	39	2.5	2.4	222
Factory peas	20	9	2.9	2.1	39
Dry beans	71	17	2.0	6.2	34
Factory beans	21	5	1.5	1.8	23
Corn for grain	15	4	1.3	1.5	14
Other grain	20	25	4.3	4.7	-31
Other crops	7	3	2.6	1.3	14
Hens	16	2	367	1355	3158
Chickens raised	36	5	396	184	13334
Dairy cows	200	144	2.9	3.4	91
Sheep	7	—	28.6	—	200
Hogs	25	3	6.8	51.0	16

APPENDIX TABLE 7

*Seasonal Variation in the Number of Workers Employed on Eastern
United States Dairy Farms, Average of 1942 and 1943**

First day of month	Per cent of yearly average			Hired workers as per cent of total
	Hired	Family	All labor	
January	61	91	81	25
February	68	90	82	26
March	68	92	84	27
April	76	98	91	28
May	91	100	97	30
June	101	100	100	33
July	138	110	119	37
August	146	110	122	39
September	133	107	116	38
October	133	104	114	38
November	98	103	101	32
December	87	96	93	30
Year	100	100	100	33

* Computed from Farm Labor Report, May, 1943 and May, 1944. Bur. Agr. Econ., U. S. Dept. Agr. A farm worker was considered to be anyone who was doing two or more days of work during the week of the inquiry.

APPENDIX TABLE 8

*Turnover in the Regular Labor Supply of 500 Farms Keeping Dairy Cows,
by Age of Worker, for the Year Ending June 30, 1943*

Item	Number of men moving, for ages of					
	Under 26	26-37	38-44	45-64	65 or more	All men
Men leaving farm for:						
Armed forces	33	5	2	—	—	40
Other farms	10	2	1	13	4	30
Other jobs	13	9	—	14	4	40
Sick or retired	—	—	2	5	5	12
Total left farm	56	16	5	32	13	122
Men coming to farm from:						
Other farms	13	8	3	9	3	36
Other jobs	19	15	—	7	2	43
Total men coming	32	23	3	16	5	79
Net change in no. of men	-24	+7	-2	-16	-8	-43

APPENDIX TABLE 9

*Trend in Farm Wage Rates in Maine, From 1923-44**

Year	Average per month		Average per day†	Weighted average rate per month	Index nos. of farm wage rates (1910-14=100)
	With board	Without board			
1923	\$42.80	\$62.10	\$2.80	\$55.10	180
1924	43.50	62.40	2.78	55.40	181
1925	41.50	59.90	2.75	53.50	174
1926	44.10	63.50	2.72	55.80	182
1927	44.60	64.40	2.81	56.70	185
1928	45.60	64.60	2.80	57.10	186
1929	47.00	66.80	2.82	58.60	191
1930	45.00	65.10	2.72	56.70	185
1931	37.40	55.40	2.34	48.20	157
1932	25.40	40.60	1.66	34.50	112
1933	22.90	36.10	1.48	30.80	100
1934	25.90	41.70	1.74	35.50	116
1935	26.30	42.10	1.74	35.80	117
1936	27.60	44.50	1.84	37.80	123
1937	30.60	47.60	2.01	40.90	133
1938	29.23	45.10	1.90	38.90	127
1939	31.50	47.10	1.94	40.80	133
1940	31.30	49.20	1.97	41.60	136
1941	41.00	61.90	2.52	53.00	173
1942	54.60	78.60	3.42	69.10	225
1943	71.20	101.50	4.30	88.50	289
1944	84.30	120.00	5.09	105.00	342

* Information received from Paul L. Koenig and R. K. Smith, Div. Agr. Statistics, Bur. Agr. Economics, U. S. Dept. Agr.

† The average day rate was computed as a simple average of the rate with board and without board.

APPENDIX TABLE 10

Average Labor Efficiency, Size of Business, and Other Information for Dairy Farms, by Areas, Based on Surveys During 1928 to 1937

Item*	Year and area of survey and dairy product sold						
	1928		1933		1934		1928-37 all areas
	all areas milk, cream		Waldo-Knox Counties		Franklin County	Cumberland County	
			Milk	Cream	milk	milk	
Number of farms	178		110	145	110	143	989
Labor efficiency:							
Man work units per man	243		223	197	194	212	215
Cwt. milk units per man	296		320	214	299	341	290
Cows per man	5.7		6.5	5.1	5.8	6.9	5.8
Animal units per man	10.4		10.2	9.2	9.3	10.2	9.7
Crop acres per man	30		32	30	22	27	28
Hours of labor per cwt. milk	3.1		3.8	5.5	3.9	3.8	3.8
Size of business:							
Men equivalent per farm	1.9		1.7	1.5	1.8	1.9	1.8
Man work units per farm	467		368	302	354	399	378
Cows per farm	10.9		10.7	7.8	10.6	13.0	10.2
Animal units per farm	20		17	14	17	19	17
Crop acres per farm	57		52	46	39	52	49
Capital per farm	\$11025		\$6129	\$4035	\$6196	\$7064	\$6201
Pounds milk per cow	5191		4987	4161	5120	4864	4983
Per cent of labor used on dairy herd	47		54	50	57	60	51
Cwt. cost of milk production	\$ 2.80		\$ 1.76	\$ 2.09	\$ 1.94	\$ 2.18	\$ 2.16
Labor income per farm	\$233		-\$220	-\$244	-\$161	-\$ 90	\$ 41

* For a definition of terms used, see footnotes below tables 12 and 16 in the text.

APPENDIX TABLE 11

Relation of Labor Efficiency to Size of Business, Productivity, Cost of Milk Production, and Labor Income, for 989 Farms in Dairy Surveys 1928 to 1937

Item*	Average man work units per man on each farm						
	100-149	150-174	175-199	200-224	225-249	250-299	300 or more
Number of farms	172	126	149	148	119	144	131
Labor efficiency:							
Man work units per man	123	162	186	211	237	271	355
Cwt. milk per man	191	287	278	287	321	356	400
Cows per man	3.7	4.7	5.2	5.7	6.4	7.2	8.7
Animal units per man	6.1	7.7	8.7	9.6	10.7	12.1	14.4
Crop acres per man	20	22	26	29	30	34	40
Hours of labor per cwt. milk	4.7	4.1	3.8	3.8	3.6	3.5	3.4
Size of business:							
Men equivalent per farm	1.8	1.9	1.8	1.8	1.8	1.7	1.7
Man work units per farm	217	304	333	380	419	452	589
Cows per farm	6.6	8.7	9.3	10.3	11.3	12.0	14.4
Animal units per farm	10.7	14.4	15.6	17.3	19.0	20.2	23.8
Crop acres per farm	35	42	47	52	53	56	66
Capital per farm	\$5823	\$6231	\$7077	\$7208	\$7615	\$8264	\$9828
Rate of production:							
Pounds milk per cow	5120	5081	5333	5015	5012	4931	4590
Index of crop yields	93	101	100	99	101	103	103
Index of farm productivity	101	101	103	99	100	100	95
Per cent of labor used on dairy herd	57	54	53	51	52	50	48
Costs and returns:							
Net cost production per cwt. milk	\$2.39	\$2.25	\$2.24	\$2.23	\$2.13	\$2.16	\$2.21
Labor income per farm:							
1928	-\$838	-\$107	-\$ 38	+\$ 56	+\$302	+\$648	+\$655
1933-34	- 300	- 237	- 237	- 200	- 122	- 51	+ 92
1937	- 300	- 116	+ 233	+ 84	+ 417	+ 371	+ 695
All surveys	- 406	- 186	- 48	- 60	+ 137	+ 220	+ 394

* For a definition of terms used, see footnotes below tables 12 and 16 in the text.

APPENDIX TABLE 12

Relation of Man Work Units Per Farm to Labor Efficiency and Labor Income, for 989 Farms in Dairy Surveys 1928 to 1937

Item*	Man work units per farm					
	100-199	200-299	300-399	400-499	500-599	600 or more
Number of farms	127	259	251	149	94	109
Labor efficiency:						
Man work units per man	127	180	206	226	242	287
Cwt. milk per man	210	261	292	282	325	349
Cows per man	4.1	5.3	5.8	5.9	6.5	6.8
Animal units per man	6.5	8.8	9.6	10.2	10.8	11.3
Crop acres per man	22	28	27	29	29	31
Hours of labor per cwt. milk	5.0	4.4	3.8	3.8	3.5	3.1
Size of business:						
Men equivalent per farm	1.3	1.4	1.7	2.0	2.2	2.7
Man work units per farm	162	252	344	444	545	768
Cows per farm	5.2	7.3	9.7	11.7	14.7	18.2
Animal units per farm	8.3	12.2	16.0	20.2	24.4	30.3
Crop acres per farm	28	39	46	56	65	84
Capital per farm	\$4355	\$5380	\$6676	\$7825	\$9492	\$12736
Rate of production:						
Pounds milk per cow	5160	4953	5017	4744	4970	5131
Index of crop yields	94	96	102	102	103	109
Index of farm productivity	101	99	101	98	101	104
Per cent of labor used on dairy herd	58	54	52	50	51	45
Costs and returns:						
Cwt. cost of milk production	\$2.38	\$2.34	\$2.20	\$2.30	\$2.16	\$2.06
Labor income per farm:						
1928	-\$496	+\$123	+\$49	+\$ 8	+\$316	+\$1016
1933-34	- 223	- 232	- 163	- 204	- 212	+ 41
1937	- 164	+ 58	+ 119	+ 150	+ 156	+ 1172
All surveys	- 257	- 75	- 39	- 50	- 8	+ 577

* For a definition of terms used, see footnotes below tables 12 and 16 in the text.

APPENDIX TABLE 13

Relation of Number of Cows Per Herd to Labor Efficiency and Labor Income, for 989 Farms in Dairy Surveys 1928 to 1937

Item*	Number of cows per herd					
	Less than 6	6-7	8-9	10-12	13-15	16 or more
Number of farms	143	222	199	196	116	113
Labor efficiency:						
Man work units per man	156	189	201	230	235	262
Cwt. milk per man	173	235	264	308	326	411
Cows per man	3.5	4.6	5.3	6.1	6.7	8.4
Animal units per man	6.5	8.1	8.9	10.3	10.8	12.6
Crop acres per man	26	26	26	29	28	31
Hours of labor per cwt. milk	5.4	4.4	4.0	3.7	3.4	3.2
Size of business:						
Men equivalent per farm	1.3	1.5	1.7	1.8	2.1	2.5
Man work units per farm	202	281	335	424	497	662
Cows per farm	4.5	6.8	8.8	11.2	14.2	21.1
Animal units per farm	8.5	12.1	14.9	19.0	22.8	31.8
Crop acres per farm	34	39	44	54	60	78
Capital per farm	\$2749	\$5612	\$6314	\$7827	\$9291	\$13003
Rate of production:						
Pounds milk per cow	4971	5150	5031	4996	4864	4917
Index of crop yields	93	98	101	101	106	109
Index of farm productivity	99	101	100	100	100	101
Per cent of labor used on dairy herd	46	50	52	53	56	61
Costs and returns:						
Cwt. cost of milk production	\$2.51	\$2.37	\$2.29	\$2.18	\$2.15	\$2.08
Labor income per farm:						
1928	—	+\$107	+\$325	+\$223	+\$313	+\$324
1933-34	-\$173	- 168	- 185	- 222	- 198	- 103
1937	- 37	+ 170	+ 103	+ 308	+ 442	+ 150
All surveys	- 95	- 3	+ 6	+ 41	+ 97	+ 36

* For a definition of terms used, see footnotes below tables 12 and 16 in the text.

APPENDIX TABLE 14

Relation of Number of Animal Units per Farm to Labor Efficiency and Labor Income, for 989 Farms in Dairy Surveys 1928 to 1937

Item*	Number of animal units per farm					
	Less than 10	10-12	13-15	16-18	19-21	22 or more
Number of farms	162	176	193	142	101	215
Labor efficiency:						
Man work units per man	151	188	199	218	223	259
Cwt. milk per man	209	238	268	289	302	359
Cows per man	4.0	4.8	5.4	5.7	6.1	7.3
Animal units per man	6.1	7.8	9.0	9.6	10.2	12.3
Crop acres per man	24	26	28	28	28	31
Hours of labor per cwt. milk	4.8	4.4	4.1	3.7	3.7	3.3
Size of business:						
Men equivalent per farm	1.3	1.5	1.6	1.8	2.0	2.4
Man work units per farm	194	276	317	393	446	611
Cows per farm	5.1	7.1	8.6	10.2	12.2	17.2
Animal units per farm	7.8	11.5	14.4	17.3	20.3	29.0
Crop acres per farm	31	38	44	50	56	73
Capital per farm	\$4930	\$5324	\$6129	\$7158	\$8448	\$11044
Rate of production:						
Pounds milk per cow	5202	4958	4976	5086	4983	4922
Index of crop yields	93	96	99	104	104	106
Index of farm productivity	101	98	99	103	100	101
Per cent of labor used on dairy herd	51	50	53	52	53	55
Costs and returns:						
Cwt. cost of milk production	\$2.40	\$2.34	\$2.36	\$2.22	\$2.20	\$2.09
Labor income per farm:						
1928	-\$ 98	-\$ 8	+\$248	+\$171	+\$ 19	+\$537
1933-34	- 174	- 155	- 218	- 179	- 206	- 146
1937	- 36	+ 158	+ 3	+ 340	+ 455	+ 305
All surveys	- 116	- 23	- 54	+ 55	+ 45	+ 120

* For a definition of terms used, see footnotes below tables 12 and 16 in the text.

APPENDIX TABLE 15

*Relation of Acreage in Crops to Labor Efficiency and Labor Income, for
989 Farms in Dairy Surveys 1928 to 1937*

Item*	Number crop acres per farm					
	Less than 30	30-39	40-49	50-59	60-69	70 or more
Number of farms	201	194	169	130	103	192
Labor efficiency:						
Man work units per man	165	205	215	221	225	245
Cwt. milk per man	246	283	288	304	320	304
Cows per man	4.9	5.7	5.7	5.9	6.2	6.3
Animal units per man	7.6	9.6	9.6	10.2	10.5	10.5
Crop acres per man	15	22	25	30	33	40
Hours of labor per cwt. milk	4.4	4.0	3.8	3.6	3.6	3.6
Size of business:						
Men equivalent per farm	1.5	1.5	1.7	1.7	1.9	2.3
Man work units per farm	242	313	363	383	432	565
Cows per farm	7.1	8.7	9.7	10.3	12.0	14.5
Animal units per farm	11	15	16	18	20	24
Crop acres per farm	21	33	43	52	62	92
Capital per farm	\$4622	\$5830	\$6809	\$7138	\$8533	\$11186
Rate of production:						
Pounds milk per cow	5088	4924	5028	5108	5134	4838
Index of crop yields	104	103	102	98	99	94
Index of farm productivity	103	101	101	100	101	95
Per cent of labor used on dairy herd	56	54	50	51	52	49
Costs and returns:						
Cwt. cost of milk production	\$2.30	\$2.20	\$2.17	\$2.18	\$2.17	\$2.24
Labor income per farm:						
1928	-\$ 28	+\$461	+\$239	+\$150	+\$100	+\$422
1933-34	- 92	- 176	- 106	- 226	- 223	- 285
1937	- 77	+ 123	+ 115	+ 144	+ 470	+ 492
All surveys	- 75	+ 44	+ 35	- 31	+ 65	+ 101

* For a definition of terms used, see footnotes below tables 12 and 16 in the text.

APPENDIX TABLE 16

Relation of Number of Men Equivalent to Labor Efficiency and Labor Income, for 989 Farms in Dairy Surveys 1928 to 1937

Item*	Number men equivalent per farm					
	Less than 1.2	1.2-1.4	1.5-1.7	1.8-2.0	2.1-2.3	2.4 or more
Number of farms	171	245	163	127	152	131
Labor efficiency:						
Man work units per man	229	214	226	207	210	210
Cwt. milk per man	322	295	293	270	299	273
Cows per man	6.8	5.9	6.2	5.4	5.7	5.3
Animal units per man	10.9	10.1	10.3	9.2	9.6	8.8
Crop acres per man	35	30	29	26	27	25
Hours of labor per cwt. milk	4.4	4.2	4.0	3.6	3.6	3.4
Size of business:						
Men equivalent per farm	1.1	1.3	1.6	1.9	2.2	3.0
Man work units per farm	244	279	362	404	462	633
Cows per farm	7.3	7.7	10.0	10.6	12.6	15.9
Animal units per farm	12	13	17	18	21	26
Crop acres per farm	37	39	47	51	58	75
Capital per farm	\$5070	\$5807	\$7023	\$7350	\$8550	\$11513
Rate of production:						
Pounds milk per cow	4731	4909	4097	4957	5204	5185
Index of crop yields	97	97	101	99	105	106
Index of farm productivity	98	99	98	99	105	104
Per cent of labor used on dairy herd	56	53	52	51	52	49
Costs and returns:						
Cwt. cost of milk production	\$2.37	\$2.24	\$2.32	\$2.17	\$2.17	\$2.07
Labor income per farm:						
1928	+\$152	+\$113	+\$376	+\$482	-\$ 91	+\$539
1933-34	- 113	- 141	- 177	- 151	- 221	- 312
1937	+ 97	+ 167	+ 122	+ 180	+ 382	+ 166
All surveys	+ 10	+ 9	+ 27	+ 61	- 6	- 26

* For a definition of terms used, see footnotes below tables 12 and 16 in the text.

APPENDIX TABLE 17

*Relation of Farm Capital to Labor Efficiency and Labor Income, for 989
Farms in Dairy Surveys 1928 to 1937*

Item*	Farm capital per farm					
	Less than \$4000	\$4000- 4999	\$5000- 5999	\$6000- 7999	\$8000- 9999	\$10,000+
Number of farms	252	144	130	192	100	171
Labor efficiency:						
Man work units per man	168	196	212	223	222	258
Cwt. milk per man	233	255	293	291	308	348
Cows per man	4.8	5.3	5.8	6.1	6.1	6.5
Animal units per man	7.7	8.8	9.6	10.1	10.3	11.2
Crop acres per man	23	26	26	30	29	33
Hours of labor per cwt. milk	4.7	4.4	3.8	3.9	3.4	3.1
Size of business:						
Men equivalent per farm	1.4	1.5	1.7	1.8	2.1	2.3
Man work units per farm	233	304	352	407	466	588
Cows per farm	6.7	8.3	9.7	11.1	12.9	14.9
Animal units per farm	10.8	13.7	16.0	18.5	21.7	25.5
Crop acres per farm	32	41	43	55	60	75
Capital per farm	\$3082	\$4494	\$5451	\$6916	\$8954	\$13455
Rate of production:						
Pounds milk per cow	4817	4758	5036	4792	5014	5316
Index of crop yields	95	97	103	101	104	107
Index of farm productivity	98	96	102	99	102	106
Per cent of labor used on dairy herd	54	52	53	52	53	49
Costs and returns:						
Cwt. cost of milk production	\$2.20	\$2.35	\$2.26	\$2.26	\$2.16	\$2.14
Labor income per farm:						
1928	+\$ 34	-\$188	+\$367	+\$333	+\$147	+\$294
1933-34	- 138	- 216	- 54	- 240	- 181	- 291
1937	+ 48	+ 84	+ 17	+ 181	+ 184	+ 702
All surveys	- 46	- 103	+ 36	0	+ 7	+ 124

* For a definition of terms used, see footnotes below tables 12 and 16 in the text.

APPENDIX TABLE 18

Relation of Milk Production Per Cow to Labor Efficiency and Labor Income, for 989 Farms in Dairy Surveys 1928 to 1937

Item*	Pounds of milk per cow annually				
	Less than 4000	4000- 4999	5000- 5999	6000- 6999	7000 or more
Number of farms	244	273	249	138	85
Labor efficiency:					
Man work units per man	228	214	210	213	199
Cwt. milk per man	203	270	308	383	377
Cows per man	6.1	6.0	5.6	5.9	4.9
Animal units per man	10.2	9.9	9.3	9.8	8.8
Crop acres per man	30	29	27	27	27
Hours of labor per cwt. milk	5.6	4.2	3.4	3.0	2.7
Size of business:					
Men equivalent per farm	1.7	1.8	1.7	1.8	2.0
Man work units per farm	376	388	365	375	390
Cows per farm	10.1	10.9	9.8	10.5	9.6
Animal units per farm	16.8	17.9	16.1	17.2	17.1
Crop acres per farm	49	52	46	48	52
Capital per farm	\$7115	\$7093	\$7408	\$8046	\$8350
Rate of production:					
Pounds milk per cow	3331	4492	5483	6432	7711
Index of crop yields	96	98	102	106	104
Index of farm productivity	79	94	106	120	133
Per cent of labor used on dairy herd	53	53	52	53	48
Costs and returns:					
Cwt. cost of milk production	\$2.33	\$2.37	\$2.07	\$1.93	\$1.80
Labor income per farm:					
1928	-\$ 23	+\$239	+\$ 96	+\$611	+\$661
1933-34	- 279	- 229	- 88	- 97	+ 50
1937	- 88	+ 223	+ 163	+ 216	+ 508
All surveys	- 158	+ 6	+ 20	+ 142	+ 318

* For a definition of terms used, see footnotes below tables 12 and 16 in the text.

APPENDIX TABLE 19

*Relation of Crop Index to Labor Efficiency and Labor Income, for 989
Farms in Dairy Surveys 1928 to 1937*

Item*	Crop yields as per cent of average					
	Less than 80	80-89	90-99	100-109	110-119	120 or more
Number of farms	194	147	179	186	117	166
Labor efficiency:						
Man work units per man	214	190	215	227	212	223
Cwt. milk per man	261	244	286	306	287	342
Cows per man	5.6	5.1	5.8	6.1	5.8	6.3
Animal units per man	9.3	8.7	9.7	10.2	9.6	10.2
Crop acres per man	35	28	30	27	25	22
Hours of labor per cwt. milk	4.3	4.2	3.7	3.6	3.8	3.4
Size of business:						
Men equivalent per farm	1.6	1.7	1.7	1.8	1.8	1.9
Man work units per farm	344	321	374	406	390	429
Cows per farm	9.1	8.7	10.1	11.0	10.6	12.0
Animal units per farm	14.9	14.7	16.9	18.4	17.7	19.7
Crop acres per farm	57	47	52	48	46	43
Capital per farm	\$6299	\$6641	\$7506	\$8181	\$7765	\$8241
Rate of production:						
Pounds milk per cow	4617	4776	4948	5006	4962	5460
Index of crop yields	70	87	97	106	116	134
Index of farm productivity	85	93	98	103	108	117
Per cent of labor used on dairy herd	51	52	52	52	53	54
Costs and returns:						
Cwt. cost of milk production	\$2.34	\$2.27	\$2.17	\$2.17	\$2.24	\$2.14
Labor income per farm:						
1928	0	-\$248	+\$187	+\$630	+\$610	+\$518
1933-34	- 317	- 192	- 207	- 179	- 137	- 4
1937	+ 1	- 117	+ 40	+ 205	+ 397	+ 531
All surveys	- 155	- 179	- 44	+ 96	+ 185	+ 263

* For a definition of terms used, see footnotes below tables 12 and 16 in the text.

APPENDIX TABLE 20

*Relation of Farm Productivity to Labor Efficiency and Labor Income, for
989 Farms in Dairy Surveys 1928 to 1937*

Item*	Farm productivity as per cent of average					
	Less than 80	80-89	90-99	100-109	110-119	120 or more
Number of farms	168	151	202	193	123	152
Labor efficiency:						
Man work units per man	219	221	218	211	208	211
Cwt. milk per man	208	239	271	297	327	400
Cows per man	6.2	5.9	5.8	5.6	5.6	5.8
Animal units per man	10.1	9.5	10.0	9.4	9.3	9.6
Crop acres per man	33	29	30	27	26	24
Hours of labor per cwt. milk	5.6	4.6	4.1	3.5	3.2	2.9
Size of business:						
Men equivalent per farm	1.6	1.7	1.7	1.8	1.8	1.9
Man work units per farm	360	384	366	381	381	399
Cows per farm	10.3	10.2	9.8	10.1	10.2	11.0
Animal units per farm	16.6	16.5	16.7	17.0	17.1	18.2
Crop acres per farm	55	50	50	48	48	45
Capital per farm	\$6712	\$6637	\$7006	\$8070	\$7895	\$8217
Rate of production:						
Pounds milk per cow	3344	4072	4640	5335	5830	6872
Index of crop yields	82	92	98	102	113	120
Index of farm productivity	73	85	95	105	115	133
Per cent of labor used on dairy herd	54	51	52	52	53	53
Costs and returns:						
Cwt. cost of milk production	\$2.84	\$2.49	\$2.32	\$2.11	\$2.03	\$1.87
Labor income per farm:						
1928	-\$395	+\$ 44	+\$175	+\$899	+\$824	+\$623
1928-34	- 326	- 264	- 197	- 152	- 72	0
1937	- 226	+ 216	+ 105	+ 103	+ 283	+ 644
All surveys	- 305	- 52	- 25	+ 38	+ 203	+ 330

* For a definition of terms used, see footnotes below tables 12 and 16 in the text.

APPENDIX TABLE 21

Relation of Per Cent of Man Work Units Used for Dairy Herd to Labor Efficiency and Labor Income, for 989 Farms in Dairy Surveys 1928 to 1937

Item*	Per cent of man work units for dairy				
	Less than 40	40-49	50-59	60-69	70 or more
Number of farms	177	227	281	215	89
Labor efficiency:					
Man work units per man	245	220	201	201	211
Cwt. milk per man	207	268	292	342	409
Cows per man	4.0	5.3	5.9	6.9	8.6
Animal units per man	8.0	9.2	9.6	10.8	12.3
Crop acres per man	29	29	28	28	24
Hours of labor per cwt. milk	4.1	3.8	3.7	3.7	3.7
Size of business:					
Men equivalent per farm	1.9	1.8	1.7	1.6	1.7
Man work units per farm	470	397	350	324	359
Cows per farm	7.7	9.5	10.2	11.1	14.7
Animal units per farm	15.3	16.7	16.8	17.4	21.0
Crop acres per farm	56	53	50	44	40
Capital per farm	\$7577	\$7869	\$7420	\$7252	\$6247
Rate of production:					
Pounds milk per cow	5140	5074	4988	4947	4727
Index of crop yields	99	99	99	100	109
Index of farm productivity	100	101	100	100	99
Per cent of labor used on dairy herd	32	45	55	64	75
Costs and returns:					
Cwt. cost of milk production	\$2.43	\$2.22	\$2.22	\$2.15	\$2.12
Labor income per farm:					
1928	+\$692	+\$ 53	+\$164	-\$105	-\$ 16
1933-34	- 46	- 168	- 233	- 196	- 149
1937	+ 651	+ 334	- 45	- 136	- 250
All surveys	+ 324	+ 56	- 94	- 161	- 194

* For a definition of terms used, see footnotes below tables 12 and 16 in the text.

APPENDIX TABLE 22

*Comparison Among States in the Labor Efficiency on Dairy Farms**

Item	Maine	New Hampshire	Vermont	Rhode Island	Pennsylvania	New York
Number of farms	989	395	204	83	1262	3696
Year of survey	1928-37	1929-30	1931-33	1928-29	1931-37	1926-38
Man work units per man	215	231	281	211	258	225
Cows per man	5.8	8.7	10.0	7.2	5.3	7.0
Size per farm:						
Man work units	378	413	551	425	529	420
Number of cows	10.2	15.7	20.0	14.5	11.1	14.0
Number of men	1.8	1.8	2.0	2.0	2.1	2.0
Acres of crops	49	52	62	30	84	66
Labor income per farm	+\$ 5	+\$393	-\$422	+\$267	+\$150	+\$214

* Eastman, M. Gale. An Economic Study of Dairy Farming in Grafton County, New Hampshire. 1930. New Hampshire Agr. Exp. Sta. Bul. 260. 1931.

Williams, S. W. Studies in Vermont Dairy Farming. Vermont Agr. Exp. Sta. Bul. 376. 1934.

Tennant, J. L. A Study of the Organization and Management of Rhode Island Farms. Rhode Island Agr. Exp. Sta. Bul. 230. 1931.

McCord, J. E. Farm Practices and Management in Central Pennsylvania. Pennsylvania Agr. Exp. Sta. Bul. 379. 1939.

Cunningham, L. C. Dairy-Farm Management. Cornell Extension Bulletin 450. 1940.

SIZE OF LOADS AND DELIVERY COSTS FOR
LABOR IN MILK DISTRIBUTION IN
BOSTON AND PORTLAND

GEORGE F. DOW¹

PURPOSE OF STUDY

Many practices in the distribution of milk have been adopted during the war to conserve motor trucks, gasoline, tires, and man labor. These changes have resulted in a substantial increase in the efficiency of milk distribution and have helped distributors to operate their routes without an increase in margin, in spite of increased wage rates and higher prices for supplies. Some of the practices that have proved most practical should be continued in the postwar period.

After the war, new and improved substitute dairy products from the Midwest may furnish additional competition to Northeastern fluid milk and cream. It is important, therefore, for the fluid milk industry of the Northeast to make and continue in effect all practical economies in the production and distribution of milk in order to maintain a high level of fluid milk sales at adequate prices.

The fluid milk industry also faces the postwar problem of absorbing subsidy payments on milk. These payments have amounted to about one cent per quart during the summer and nearly two cents per quart during the winter. It would be most unfortunate if additional price adjustments were necessary because of an increase in distribution costs as a result of a return to daily delivery of milk and other practices that existed prior to the war.

This study was made to determine the effect of wartime practices upon the size of loads and the trend in delivery costs for labor in Portland and Boston. The results indicate the extent to which the efficiency of milk distribution has been increased and the importance of continuing these practices after the war. Such

¹ The writer wishes to acknowledge and express his appreciation to the milk distributors who cooperated in this study, and to Stewart Johnson of Cornell University who offered many helpful suggestions.

information is needed as a guide to the dairy industry in determining whether every-other-day delivery of milk and other wartime practices should be continued, and also to educate consumers as to the importance of these factors in preventing an increase in the price of milk.

ADOPTION OF WARTIME PRACTICES AFFECTING MILK DISTRIBUTION

Before the war, milk was usually delivered to homes on a daily basis, often in the early morning before daylight. The deliveryman called back later in the day for weekly collections and to make special deliveries of milk and cream whenever customers requested an additional supply. At some stores and other wholesale places, prewar deliveries of milk and cream were received from a number of competing distributors. Several deliveries were made daily to many wholesale customers, and the milk that was not sold during the first day might be returned to the distributor.

Every-other-day delivery of milk to retail customers was started in Boston by some of the distributors on a voluntary basis in January 1942. These dealers also shifted over to daylight delivery, and eliminated callbacks and special deliveries. Some similar progress was made in the Portland market during the first quarter of 1942. These practices later became official requirements for all distributors by special orders of the State Milk Control Boards which became effective on March 15, 1942 in Boston and on June 8, 1942 in Portland. Rulings of the Office of Defense Transportation also exerted pressure on milk distributors to adopt these practices. The elimination of all special deliveries and callbacks was ordered by ODT on March 15, 1942; and the total mileage travelled on delivery routes was ordered, effective June 1, 1942, to be reduced at least one-fourth, exclusive of savings from the elimination of callbacks and special deliveries. On May 27, 1943, ODT also required that deliveries on wholesale routes be limited to six days a week, thereby eliminating Sunday deliveries.

The efficiency of milk delivery on wholesale routes was increased further by a Food Distribution Order on February 1, 1943 limiting the number of competing distributors who could supply a store, permitting delivery of milk only upon advance or standing

orders, eliminating the returns of milk that were not sold on the previous day, and requiring a bottle deposit for returnable containers used in the wholesale trade.

The sale of all heavy cream, with only a few minor exceptions, was prohibited on November 25, 1942 by a federal order. This decreased the volume of cream sold, but reduced the number of products which distributors were required to deliver. The sale of milk to consumers in pint bottles also was prohibited on February 1, 1943 except for milk consumed on the premises as in hotels or restaurants.

Reference also should be made to Limitation Orders which curtailed the volume of sales and consequently had some adverse effect upon the efficiency of milk distribution. This program for conserving milk supplies limited the amount of fluid milk sales to the amount sold in June 1943, and reduced the sales of fluid cream and byproducts to one-fourth less than that of June 1943. These limitations became effective on October 17, 1943 for Boston and on November 1, 1943 for Portland.

Of the various wartime practices which have increased the efficiency of milk distribution, by far the most important has been the adoption of every-other-day delivery on retail routes.

NUMBER OF DISTRIBUTORS COOPERATING IN SURVEY

In the Portland market, the survey included each of the four largest distributors, namely, H. P. Hood and Sons, Maine Dairy, Oakhurst Dairy, and Old Tavern Farms. These distributors handle about 90 per cent of the fluid milk sales in Portland.² Most of the information for three of these distributors, other than H. P. Hood and Sons, was obtained by the writer direct from the distributors' records.

At Boston, the study included eight of the largest distributors and represented slightly more than two-thirds of the total sales in that market.³ The cooperating distributors were David But-

² Unpublished information obtained from Clayton Osgood, State Dairy Inspector, Maine Dept. Agr.

³ Computed from monthly reports of S. W. Tator, Milk Market Administrator for Boston.

trick Company, Deerfoot Farms Company, Herlihy Brothers, H. P. Hood and Sons, J. F. McAdams and Brothers, United Farmers Cooperative Creamery Association, White Brothers, and Whiting Milk Company. Most of the information for Boston was compiled by the distributors, and was checked carefully in numerous ways. Information obtained from S. W. Tator, Milk Market Administrator for Boston, shows the same percentage increase in fluid milk sales from October 1941 to October 1944 for these cooperating dealers as that computed from figures obtained in this survey.

TREND IN NUMBER OF DELIVERY ROUTES FROM 1941 TO 1944

The eight Boston distributors included in this study were operating a total of 1103 routes during October 1944. These routes included 857 retail and 246 wholesale routes. The four Portland distributors had a total of 86 routes of which 68 were retail and 18 wholesale.

The number of retail routes normally might have been expected to decrease about one-half when the delivery of milk was changed from a daily basis to every-other-day delivery. The actual decrease in the number of retail routes, however, was only 10 per cent for Boston and was an increase of 5 per cent for Portland (table 1). The expected large decrease in the number of retail routes did not occur due to the substantial increase in the volume of retail sales. These sales increased 35 per cent for Boston and 57 per cent for Portland. The increased volume of retail sales made it impossible for every-other-day delivery to result in a large decrease in the number of retail routes, but made possible a much greater efficiency in the distribution of milk.

In the operation of wholesale routes, delivery continued on a daily basis, except for the elimination of Sunday deliveries. Consequently the wartime increase in the volume of sales caused an increase in the number of wholesale routes amounting to 26 per cent for Boston and 29 per cent for Portland (table 1).

The total number of all routes of cooperating dealers, both retail and wholesale, decreased 4 per cent for Boston and increased 9 per cent for Portland. The difference between these two markets was due partly to the greater increase in the total volume of sales at Portland as compared with Boston.

TREND IN THE TOTAL VOLUME OF DAIRY PRODUCTS SOLD FROM 1941 TO 1944

The total volume of all products sold by the distributors included in this study increased 23 per cent at Boston and 57 per cent at Portland from 1941 to 1944. There are two reasons for this substantial increase in the total volume of sales. The most important reason was the wartime increase in total milk consumption which, for the entire Boston market, was approximately 19 per cent from October 1941 to October 1944.⁴ Milk consumption at Portland was increased to an even greater extent by the influx of shipyard workers into that area.

The second reason for the increase in sales by the distributors included in this study has been the decrease in the total number of milk handlers, with a larger volume of sales accruing to those remaining. The number of handlers in the Boston market decreased from 412 to 281, representing a reduction of one-third from October 1941 to October 1944. In the city of Portland, the number of distributors decreased from 31 to 19, or a reduction of 39 per cent from 1941 through 1944.⁵ Most of these handlers who ceased to distribute milk had relatively small businesses, but the trend has made possible some consolidation of routes and some increase in the total volume of sales handled by the remaining dealers.

Under wartime conditions and regulations, a considerable difference has occurred in the percentage trend in the sale of various dairy products. Total sales of both fluid milk and cottage cheese increased materially in both markets (table 1). Milk consumption was stimulated by an increase in consumer purchasing power, by the rationing of many other foods, and by an increased knowledge of the nutritional value of milk. The increase in the sale of cottage cheese was especially pronounced in the wholesale trade, with cottage cheese used extensively in hotels and restaurants as a substitute for butter. The sale of eggs on milk routes in Boston showed the largest proportional increase of any product handled, with 1944 sales on retail routes about 10 times larger than in 1941.

The total volume of cream sales by the cooperating distributors dropped off 9 per cent at Boston and 15 per cent at Portland be-

⁴ Same reference as in footnote 3.

⁵ Same reference as in footnote 2.

cause of the elimination of heavy cream and the limitation imposed upon the total amount of cream that could be sold. The sales of skim milk, buttermilk, and butter were of minor importance prior to the war, but showed a considerable percentage decrease.

The increased sales of milk, cottage cheese, and eggs considerably more than offset the decreased sales of cream, butter, and other products. The result was a substantial increase in the total volume of all sales, both retail and wholesale (table 1).

TABLE 1

*Trend in the Number of Delivery Routes and in the Total Volume of Dairy Products Sold by 8 Distributors in Boston and 4 in Portland
(From October 1941 to October 1944)**

Item	Boston			Portland		
	Retail sales	Wholesale	All sales	Retail sales	Wholesale	All sales
Number of routes:						
October 1944	857	246	1103	68	18	86
October 1941	956	196	1152	65	14	79
Per cent change from 1941 to 1944 in:						
Number of routes	-10	+26	-4	+5	+29	+9
Total volume sold:						
Milk	+36	+17	+27	+60	+77	+67
Cream	+22	-16	-9	-17	-15	-15
Skim and buttermilk	-23	-60	-47	-56	-65	-63
Cottage cheese	-16	+91	+17	+45	+103	+73
Butter	-39	-43	-43			
Eggs	+918	-65	+648	+140	-35	+2
Other products	+198	-23	-6			
All products†	+35	+11‡	+23	+57	+57	+57

* One of the eight distributors at Boston did not have complete data for October 1941, but estimates were made based on the trend for the other seven distributors.

† Includes the total quarts of milk, cream, skim milk, buttermilk, ice cream and ice cream mix; pounds of cottage cheese, butter, bacon, and sausage; and number of packages of chocolate syrup and other miscellaneous products.

‡ Although the total volume of sales increased only 11 per cent on wholesale routes, there was a 33 per cent increase in the number of containers or packages sold and a similar increase in terms of point values. The reason for this difference was due to a relatively greater increase of sales in small containers, with an increase of 75 per cent for sales in one-half pints and one-third quarts, as compared with an increase of 16 per cent for sales in pints, and an increase of only 6 per cent for sales in quart bottles or bulk sales in cans. An explanation of point values is given in Tables 2 and 6.

LOADS CARRIED ON RETAIL ROUTES

The average size of load on retail routes in October 1944 was 484 units at Boston and 490 units at Portland. A "unit" represents one container or package sold with the exception of

bulk sales in cans in which a unit represents one quart of product sold. Total units are computed by adding together the quart bottles of milk, pint and one-half pint bottles of cream, pounds of butter, dozens of eggs, and pounds or packages of cottage cheese.

Point values also are used to measure the size of loads, with

TABLE 2

*Average Daily Load on Retail Routes of 8 Distributors in Boston and 4 in Portland, During October 1944**

Product sold and size of container	Number of container units delivered daily per route in:					
	Boston			Portland		
	Retail sales	Whole- sale	All sales	Retail sales	Whole- sale	All sales
Milk:						
Quarts	414.0	4.1	418.1	399.5	24.7	424.2
Pints	—	.5	.5	—	—	—
½ quarts	—	1.5	1.5	—	8.3	8.3
½ pints	—	10.6	10.6	—	17.0	17.0
Bulk (qts.)	—	2.2	2.2	—	5.0	5.0
Total milk	414.0	18.9	432.9	399.5	55.0	454.5
Chocolate milk:						
Quarts	2.2	—	2.2	4.8	—	4.8
½ pints	—	1.3	1.3	.1	5.6	5.7
Total choc.	2.2	1.3	3.5	4.9	5.6	10.5
Cream:						
Quarts	.3	.2	.5	.1	.5	.6
Pints	14.9	.5	15.4	2.6	.3	2.9
½ pints	15.3	.3	15.6	10.2	1.3	11.5
Bulk (qts.)	—	.6	.6	—	.3	.3
Total cream	30.5	1.6	32.1	12.9	2.4	15.3
Skim milk:						
Quarts	.3	—	.3	1.0	.3	1.3
Buttermilk:						
Quarts	1.4	.1	1.5	.8	.1	.9
Cottage cheese:						
Lbs. or pkgs.	2.9	.1	3.0	3.6	.4	4.0
Butter, pounds	2.8	.1	2.9	—	—	—
Eggs, dozens	6.8	—	6.8	3.1	.7	3.8
Other products†	1.2	.3	1.5	—	—	—
Total misc.	15.4	.6	16.0	8.5	1.5	10.0
Total units all products	462.1	22.4	484.5	425.3	64.5	490.3
Total points‡	462.1	10.5	472.6	425.3	30.8	456.6

* Similar information for October 1941 is given in appendix table 1.

† Includes pounds of bacon and sausage, quarts of ice cream and ice cream mix, and packages of chocolate syrup, cocoa marsh, orange juice, and tomato juice.

‡ One point for each container unit to retail customers and one-half point for each unit to wholesale customers, with the exception of wholesale deliveries in bulk which were one-fourth point per quart.

one point for each unit delivered to retail customers and one-half point for each unit delivered to the few wholesale customers that were served from retail routes. The number of points handled daily per retail route averaged 473 at Boston and 457 at Portland.

The average amount of the various products sold, by size of container, is shown in table 2. Retail sales of milk were entirely in quart bottles due to the wartime regulation eliminating pint bottles of milk on retail routes. This regulation affected relatively few customers in Boston because prewar sales included only about 2 pints of milk per retail route daily. In Portland, however, prewar sales included 42 pints of milk per route daily (appendix table 1).

The total units of cream sold per route at Boston were more than twice the number per route at Portland. The units of cream sold at Boston were nearly equally divided into pints and one-half pints, but at Portland were mostly one-half pints. The reason for the additional cream sales at Boston was due primarily to a lower price for cream. The price per one-half pint of light cream was 15.5¢ at Boston as compared with 17.5¢ at Portland; and the pint price of cream was 26.5¢ at Boston as compared with 30.5¢ at Portland. An additional saving of 1¢ per one-half pint could be made at Boston if cream was purchased at a store instead of by home delivery.

Milk was by far the most important product sold on retail routes, representing 89 per cent of total points sold at Boston

TABLE 3

Trend on Retail Routes in the Relative Importance of Various Dairy Products Sold, for 8 Distributors in Boston and 4 in Portland, October 1941 to October 1944

Product sold	Per cent of total points delivered per route daily in:*			
	Boston		Portland	
	October 1944	October 1941	October 1944	October 1941
Milk	89	88	93	90
Chocolate milk	1	1	2	2
Cream	7	8	3	5
Other products	3	3	2	3
	100	100	100	100

* An explanation of point values is given below table 2.

and 93 per cent at Portland (table 3). Chocolate milk was only 1 to 2 per cent of the total. Cream sales included 7 per cent of the retail load at Boston but only 3 per cent at Portland. Normally when sales are unrestricted, cream represents an additional 1 to 2 per cent of the total. Other products handled, including skim-milk, buttermilk, cottage cheese, butter, eggs, and miscellaneous, comprised only about 3 per cent of the total size of loads.

Retail routes in some instances supplied a few wholesale customers who could not be served conveniently from wholesale routes. These sales in October 1944 included 23 units per route daily at Boston and 65 units at Portland (table 4). These wholesale deliveries, however, represented only 5 per cent of the total units delivered on retail routes at Boston and 13 per cent at Portland. In October 1941, when retail deliveries were made daily, a slightly greater proportion of the retail route load was for wholesale customers.

TABLE 4

Volume of Sales on Retail Routes That Was Delivered to Wholesale Customers, by 8 Distributors in Boston and 4 in Portland, October 1941 and October 1944

Product sold	Boston		Portland	
	October 1944	October 1941	October 1944	October 1941
Units per route to wholesale customers:				
Milk	19	30	55	44
Chocolate milk	1	5	6	6
Cream	2	4	2	5
Other products	1	2	2	2
Total units	23	41	65	57
Total points*	11	19	31	27
Wholesale volume as per cent of:				
Total units	5	12	13	16
Total points*	2	6	7	8

* An explanation of point values is given below table 2.

The average size of loads on retail routes increased considerably from October 1941 to October 1944. For Boston, the size of load increased 43 per cent, from 329 to 473 points per load (table 5). For Portland, the increase was 35 per cent, from 337

to 457 points per load. These figures indicate that there has been a considerable increase in the efficiency of milk distribution as a result of increased milk consumption and the adoption of every-other-day delivery and other wartime practices.

TABLE 5

*Trend in the Average Daily Load Per Retail Route, for 8 Distributors in Boston and 4 in Portland, October 1941 to October 1944**

Product sold	Number of points delivered per route daily in:†					
	Boston			Portland		
	October 1944	October 1941	Per cent change	October 1944	October 1941	Per cent change
Milk	422.9	288.0	+47	425.8	308.3	+40
Chocolate milk	2.3	4.3	-35	7.7	6.1	+24
Cream	31.3	25.6	+22	14.0	13.7	-25
Skim and buttermilk	1.7	2.2	-23	2.0	4.9	-59
Cottage cheese	3.0	3.3	-9	3.8	2.7	+41
Butter, eggs, others	10.9	5.7	+91	3.3	1.7	+94
Total	472.6	329.1	+43	456.6	337.4	+35

* One of the eight distributors at Boston did not have complete data for October 1941, but estimates were made based on the trend for the other seven distributors.

† An explanation of point values is given below table 2.

LOADS CARRIED ON WHOLESALE ROUTES

The average size of load on wholesale routes in October 1944 was 1940 units for Boston and 1675 units for Portland.⁶ A "unit" represents one container or package handled except for bulk sales in cans in which a unit equals one quart. The number of units handled per wholesale route at Boston was 4.0 times the amount per retail route, and at Portland was 3.4 times that of a retail route. The units handled on the wholesale routes, however, included more small containers such as one-half pint and one-third

⁶ Daily volume is computed on the basis of seven days per week, although Sunday deliveries were eliminated in October 1944 by making extra deliveries on Saturday. Corresponding figures based on six-day-a-week delivery are given in appendix table 3. From some standpoints, the data for 1941 and 1944 are more comparable if both are computed on a seven-day-week basis. Some drivers in 1944 had to make an extra trip on Saturday to handle the Sunday supply; also some drivers in 1941 did not have to cover their entire routes on Sunday because many stores were closed on that day.

TABLE 6

*Average Daily Load on Wholesale Routes of 8 Distributors in Boston and 4 in Portland During October 1944**

Product sold and size of container	Point values per unit	Average volume delivered daily per route			
		No. of container units		Number of points	
		Boston	Portland	Boston	Portland
Milk:					
Quarts	1.0	610.8	444.2	610.8	444.2
Pints	.5	85.2	55.1	42.6	27.6
½ quarts	.5	259.4	194.5	129.7	97.2
½ pints	.5	559.6	501.7	279.8	250.8
Bulk (qts.)	.4	184.9	281.5	74.0	112.6
Total milk		1699.9	1477.0	1136.9	932.4
Chocolate milk:					
Quarts	1.0	.1	1.6	.1	1.6
½ quarts	.5	1.2	29.6	.6	14.8
½ pints	.5	24.6	44.2	12.3	22.1
Bulk (qts.)	.4	.4	—	.2	—
Total choc.		26.3	75.4	13.2	38.5
Cream:					
Quarts	1.5	10.3	11.3	15.4	17.0
Pints	1.0	15.8	1.3	15.8	1.3
½ pints	1.0	75.2	27.8	75.2	27.8
Bulk (qts.)	.6	77.7	40.7	46.6	24.4
Total cream		179.0	81.1	153.0	70.5
Skim milk:					
Bulk (qts.)	.4	1.2	13.7	.5	5.6
Buttermilk:					
Quarts	1.0	1.7	.7	1.7	.7
½ pints	.5	.3	—	.2	—
Bulk (qts.)	.4	2.3	1.0	.9	.4
Cottage cheese:					
Lbs. or pkgs.	1.0	9.6	16.3	9.6	16.3
Butter, pounds	1.0	6.4	—	6.4	—
Eggs, dozens	1.0	.3	9.6	.3	6.2
Other products	†	12.5	—	8.6	—
Total misc.		34.3	41.3	28.2	29.2
Total all products		1939.5	1674.8	1331.3	1070.6

* Similar information for October 1941 is given in appendix table 2.

Daily volume is computed on the basis of seven days per week, although Sunday deliveries were eliminated by making extra deliveries on Saturday.

† One point per package except for ice cream mix which was 0.6 point per quart.

quart bottles. The total volume of all milk handled per wholesale route (converted to quart volume) was approximately 2.5 times as much as on a retail route.

A more accurate measure of the size of loads on wholesale routes was computed by using point values for containers of different sizes. One point was allowed for each quart of milk, pint

or one-half pint of cream, pound of butter, dozen of eggs, or pound of cheese; 1.5 points per quart of cream; 0.5 point per pint, one-third quart, or one-half pint of milk; and 0.4 point per quart of bulk milk. On this basis, the size of load on wholesale routes averaged 1331 points for Boston and 1071 points for Portland. The detailed amount of each product sold and unit values, by size of containers, is given in table 6.

Milk sales in October 1944, including chocolate milk, comprised 86 per cent of the total load on wholesale routes at Boston and 90 per cent at Portland (table 7). Cream sales were 12 per cent of the total at Boston and 7 per cent at Portland. All other products represented only 2 or 3 per cent of the total points. These proportions are rather similar to those for retail routes with the exception that wholesale deliveries tended to have a slightly greater proportional sale of cream and less of milk.

TABLE 7

Trend on Wholesale Routes in the Relative Importance of Various Dairy Products Sold, for 8 Distributors in Boston and 4 in Portland, October 1941 to October 1944

Product sold	Per cent of total points delivered per route daily in:*			
	Boston		Portland	
	October 1944	October 1941	October 1944	October 1941
Milk	85	79	87	77
Chocolate milk	1	2	3	5
Cream	12	15	7	12
Other products	2	4	3	6
	100	100	100	100

* An explanation of point values is given in table 6.

Quart bottles were used for 58 per cent of the total volume of milk wholesaled at Boston, as compared with 47 per cent at Portland. Bulk sales of milk in cans represented 17 per cent of the total at Boston and 30 per cent at Portland. For cream wholesaled, 68 per cent was sold in cans, both at Boston and at Portland.

The increase in size of loads on wholesale routes from October 1941 to October 1944 was 6 per cent for Boston and 21 per cent for Portland if computed on the basis of delivery for seven days

per week in both years. However, if allowance is made for only six-day delivery in 1944, in contrast to seven-day delivery in 1941, the increased size of loads would be 24 per cent for Boston and 41 per cent for Portland.⁷ This increase of 24 per cent at Boston was considerably less than for retail routes which showed an increase of 43 per cent. The principal reason for the smaller rate of increase on wholesale routes at Boston was due to eliminating deliveries only one day a week as compared with every-other-day delivery on retail routes. Existing truck capacity and the physical ability of the deliveryman were also limiting factors on the wholesale routes which carried a relatively large load. The increase in size of wholesale loads at Portland was greater than at Boston because the prewar loads at Portland were one-third smaller and thus were more readily adapted to an increase in volume.

TABLE 8

*Trend in the Average Daily Load Per Wholesale Route, for 8 Distributors, in Boston and 4 in Portland, October 1941 to October 1944**

Product sold	Number of points delivered per route daily in:†					
	Boston			Portland		
	October 1944	October 1941	Per cent change	October 1944	October 1941	Per cent change
Milk	1136.9	990.0	+15	932.4	676.9	+38
Chocolate milk	13.2	31.3	-58	38.5	46.6	-17
Cream	153.0	184.9	-17	70.5	106.2	-34
Skim and buttermilk	3.3	8.6	-62	6.7	27.7	-76
Cottage cheese	9.6	5.7	+68	16.3	10.5	+55
Butter, eggs, others	15.3	29.7	-48	6.2	17.4	-64
Total	1331.3	1250.2	+ 6	1070.6	885.3	+21

* Daily volume is computed on the basis of seven days per week, although Sunday deliveries were eliminated by making extra deliveries on Saturday. Corresponding figures based on 6-days-a-week delivery for October 1944 are given in appendix table 3.

† An explanation of point values is given in table 6.

RELATIVE IMPORTANCE OF RETAIL AND WHOLESALE DELIVERIES

Retail deliveries by the Boston distributors included in this study during October 1944 included 55 per cent of their total

⁷ See footnote 6 for discussion of six-day versus seven-day basis of computing size of load in October 1944.

milk sales as compared with 45 per cent sold wholesale. Retail sales of cream included 24 per cent of the total. Comparable figures for retail sales by the Portland distributors were 58 per cent for milk and 19 per cent for cream. Only minor changes have occurred in these percentages from October 1941 to October 1944, with a slight increase in the proportion of milk and cream retailed at Boston and a slight decrease in retail sales of milk at Portland (table 9).

TABLE 9

Trend in the Relative Importance of Retail and Wholesale Deliveries of Milk and Cream, for 8 Distributors in Boston and 4 in Portland, October 1941 to October 1944

Product sold	Per cent of total volume of sales in:*			
	Boston		Portland	
	October 1944	October 1941	October 1944	October 1941
Milk:				
Retail	55	51	58	60
Wholesale	45	49	42	40
Total	100	100	100	100
Cream:				
Retail	24	18	19	19
Wholesale	76	82	81	81
Total	100	100	100	100

* Volume in this table is expressed as quart equivalent, with pint containers divided by two, and one-half pints divided by four.

LABOR UTILIZATION ON DELIVERY ROUTES

An average of about one and one-third men was used per route, with the exception of an average of 1.57 men on wholesale routes at Boston (table 10). The labor requirements on retail routes included the regular drivers who made six trips per week, and the foremen who supervised these routes and served as relief drivers in place of the regular drivers during their one day off each week. The retail route foreman handled five or six routes, taking a different route on each successive day of the week, allowing for Sunday off. A slight amount of additional help also had to be available to replace regular drivers or route foremen who

were sick or on vacation. Sometimes if there was a temporary shortage of help, the retail routemen also worked on their day off, receiving additional pay.

TABLE 10

Number of Men Per Route and Volume Delivered Per Man on Retail and Wholesale Routes of 8 Distributors in Boston and 4 in Portland, October 1944 and October 1941

Item	Boston			Portland		
	October 1944	October 1941	Per cent change	October 1944	October 1941	Per cent change
Number of men per route:						
Retail routes	1.33	1.24	+ 7	1.27	1.26	+ 1
Wholesale routes	1.57	1.54	+ 2	1.34	1.50	-11
Point volume delivered daily per route:*						
Retail routes	473	329	+43	457	337	+35
Wholesale routes	1331	1250	+ 6	1071	885	+21
Number of points delivered daily per man:*						
Retail routes	355	265	+34	360	268	+34
Wholesale routes	848	812	+ 4	799	590	+35

* An explanation of point values is given in tables 2 and 6.

Daily volume is computed on the basis of seven days per week, although Sunday deliveries on wholesale routes in October 1944 were eliminated by making extra deliveries on Saturday. Corresponding figures based on 6-days-a-week delivery for October 1944 are given in appendix table 3.

On wholesale routes the drivers had Sunday off due to the wartime regulation eliminating Sunday delivery. The union contract at Boston provided for one foreman to serve as supervisor and relief driver for every six wholesale routes. Several of the Boston distributors also employed route helpers or "strikers" who assisted the regular drivers, thereby increasing the average number of men used per wholesale route at Boston.

Relatively little change occurred from 1941 to 1944 in the number of deliverymen employed per route, although there was a large increase in the size of loads and in volume handled per man. At Boston, the number of men per retail route increased only 7 per cent, which with an increase of 43 per cent in size of load resulted in a 34 per cent greater volume handled per man (table 10). At Portland, the volume of retail sales handled per man also increased 34 per cent as a result of larger loads due to increased consumption, every-other-day delivery, and other wartime regulations.

On the wholesale routes at Portland, the number of men employed per route decreased 11 per cent which, with a 21 per cent addition in size of load, resulted in a 35 per cent greater volume handled per man. This increase of about one-third in the efficiency of use of labor on wholesale routes in Portland was approximately the same rate as on the retail routes. This was a rather remarkable achievement inasmuch as wholesale deliveries were eliminated only on Sunday instead of every-other-day as for retail routes. At Boston, the increase in labor efficiency on wholesale routes was only 4 per cent if computed on the basis of the total volume delivered weekly per man. However, if labor efficiency were computed on the basis of the volume delivered per day, with a six-day week in 1944 as compared with a seven-day week in 1941, the increased volume handled per man daily was 22 per cent for Boston.

The average number of points handled per man on retail routes in October 1944 was 355 for the Boston distributors. This was approximately the same as the average of 360 points per man for the four largest distributors at Portland. On wholesale routes, the number of points handled per man averaged 848 for Boston, which was somewhat larger than the average of 799 for Portland (table 10).

DELIVERY COSTS FOR LABOR IN OCTOBER 1941 AND OCTOBER 1944

Average earnings received by deliverymen on retail routes at Boston were \$66.02 per week in October 1944 as compared with \$47.75 in October 1941 (table 11). This was an increase of 38 per cent in the earnings received per man. In Portland, the retail routemen received a somewhat lower wage, but the increase from 1941 to 1944 was 44 per cent, or an advance from \$37.62 to \$54.11 per week.

The average wage rate paid all delivery labor used on wholesale routes was somewhat less than on retail routes because of the use of more route helpers on the wholesale routes. These route helpers received a minimum wage rate of \$28 per week under the labor union contract at Boston, as compared with \$51.33 for experienced drivers working a six-day week. The average earnings for all deliverymen on wholesale routes in October 1944 was \$47.77 per man for Boston and \$43.84 for Portland. The increase from

TABLE 11

Delivery Costs for Labor on Retail and Wholesale Routes of 8 Distributors in Boston and 4 in Portland, October 1944 and October 1941

Item	Boston			Portland*		
	October 1944	October 1941	Per cent change	October 1944	October 1941	Per cent change
Weekly earnings per deliveryman:†						
Retail routes	\$66.02	\$47.75	+38	\$54.11	\$37.62	+44
Wholesale routes	47.77	41.06	+16	43.84	31.77	+38
Labor cost per route daily:						
Retail routes	12.54	8.46	+48	9.82	6.77	+45
Wholesale routes‡	10.71	9.03	+19	8.39	6.81	+23
Labor cost per 100 points delivered:§						
Retail routes	2.65	2.57	+ 3	2.15	2.01	+ 7
Wholesale routes	.80	.72	+11	.78	.77	+ 1

* Labor earnings in Portland were not available for one distributor whose route-men operated their own trucks.

† Includes all men who went out on the routes such as the regular driver, helpers, foreman, and relief drivers.

‡ Computed on the basis of 7-days-per-week, although Sunday deliveries in October 1944 were eliminated by making extra deliveries on Saturday.

§ An explanation of point values is given in tables 2 and 6.

1941 to 1944 amounted to 16 per cent at Boston and 38 per cent at Portland.

The labor cost for delivering a quart of milk or per point of product handled depends not only on wages paid labor but also on the volume handled per man. The rapid rise in wage rates has been nearly offset by the increased efficiency in the use of labor used on delivery routes. The resulting cost for labor per point of product handled increased only 0.01 cent on wholesale routes at Portland, 0.14 cent on retail routes at Portland, and 0.08 cent on both retail and wholesale routes at Boston. The percentage increase in cost per point retailed was 3 per cent at Boston and 7 per cent at Portland; on wholesale routes it was 11 per cent for Boston and only 1 per cent for Portland.

The average cost for delivery labor on retail routes at Boston was 2.65 cents per point during October 1944. This cost was one-half cent more per point than at Portland due to the higher wage rates paid at Boston (table 11). On wholesale routes, the costs for labor were 0.80 cent per point at Boston and 0.78 cent at Portland, with the higher wage rate at Boston nearly offset by larger loads and more efficient use of labor.

METHODS OF DETERMINING DRIVERS' EARNINGS

The drivers employed by five of the eight distributors at Boston were organized under a labor union contract. Under the union contract, the minimum rate of pay guaranteed an experienced retail route driver was \$44 per week. The earnings of these drivers, however, usually was considerably more than the \$44 minimum as a result of computing earnings on a commission basis if total commissions exceeded \$44. The commission paid retail route drivers was 11.15 per cent on retail collections, with the exception of a payment of 2 cents per pound of butter or per dozen of eggs.⁸ For wholesale deliveries made on retail routes, the commission was 3.72 per cent for bottled sales and 2.5 per cent for bulk sales. A breakage allowance of \$1 per week also was allowed a retail driver; and some drivers who did additional bookkeeping work received an extra \$1 per week. The average earnings for a regular retail route driver was about \$65 per week.

A regular wholesale route driver, under the union contract, was not paid on a commission basis, but received a flat salary of \$51.33 for a six-day-week. In addition he received a \$3 per week allowance for breakage.

A route foreman received at least \$5.50 more per week than the average for his subordinate drivers. Some of those on retail routes received up to \$7.50 more per week, and those on wholesale routes received \$8.25 more for a six-day-week.

Several of the distributors in Portland and Boston who were not under a labor union contract paid a low base salary to retail drivers to which was added a commission based on collections. On wholesale routes, however, most of these distributors paid a straight salary without commission.

A discussion of wage rates also involves a consideration of the amount of time off with pay. Nearly all distributors arranged for their drivers to take one day off per week and to have a two week's vacation with pay. Route foremen at Boston also were allowed special holidays. In Portland, where the labor problem was very acute, the amount of time off was somewhat more restricted than at Boston but in most cases the amount of time off was about the same in 1944 as in 1941.

⁸ The commission of 11.15 per cent was based on retail milk at 16 cents per quart, with an adjustment of 0.35 per cent in the rate for each one-half cent change in the price of milk.

The Boston labor union contract provided for a maximum 48-hour week, with extra pay if more time were required. Day-light delivery was provided in the contract by specifying that deliverymen were not required to report for work earlier than was reasonably necessary for starting deliveries at 7:00 a.m.

COMPARISON BETWEEN BOSTON, PORTLAND, AND UPSTATE NEW YORK MARKETS AS TO SIZE OF LOADS AND DELIVERY COSTS FOR LABOR

A similar study has been made for six Upstate New York markets, which permits a comparison with routes in Boston and Portland. The figures for these New York markets were fairly comparable to those for Boston, during October 1944, except for somewhat smaller loads in New York on both retail and wholesale

TABLE 12

*Summary of Size of Loads and Delivery Costs for Labor in Boston and
Portland as Compared with 6 Upstate New York Markets**

Item	Retail routes in:			Wholesale routes in:		
	Boston	Port- land	Upstate New York	Boston	Port- land	Upstate New York
Number of routes included in study	857	68	484	246	18	150
Average per route daily, October 1944:						
Total quarts milk	426	442	384	1072	966	805
Number of points, all products†	473	457	418	1331	1071	1077
Number men per route	1.33	1.27	1.23	1.57	1.34	1.01
Number points per man‡	355	360	339	848	799	1064
Labor earnings weekly per man	\$66	\$54	\$64	\$48	\$44	\$56
Labor earnings per point delivered†	2.65¢	2.15¢	2.69¢	0.80¢	0.78¢	0.75¢
Per cent change October 1941 to October 1944 in:						
Number of routes	-10	+ 5	‡	+26	+29	‡
Points per route†	+43	+35	+54	+ 6	+21	+24
Number men per route	+ 7	+ 1	- 1	+ 2	-11	‡
Number points per man‡	+34	+34	+56	+ 4	+35	‡
Labor earnings per man	+38	+44	+80	+16	+38	+41
Labor earnings per point†	+ 3	+ 7	+16	+11	+ 1	+ 9

* Information for New York was obtained from Stewart Johnson, Milk Distribution in 6 Large Cities of Upstate New York, Cornell Dept. Agr. Econ., Mimeographed report AE 517, March 1945. The Cornell figures for average daily volume of sales on wholesale routes in October 1944 were based on 6-days-a-week delivery, but in the above table have been adjusted to a 7-day-week basis so as to be comparable with the figures for Boston and Portland.

† An explanation of point values is given in tables 2 and 6.

‡ Information was not available.

routes (table 12). The retail delivery cost for labor per point of product handled was about one-half cent per point higher than at Portland due to differences in wage rates. On wholesale routes, the cost per point was slightly lower in Upstate New York because fewer men were employed per route.

The increase in volume handled per man from 1941 to 1944 was slightly greater on the delivery routes in Upstate New York but was offset by a somewhat greater increase in wage rates (table 12).

INCREASE IN DELIVERY COSTS IF RETURN TO PREWAR SIZE OF LOADS

The exact effect of a change to daily delivery and other prewar practices is difficult to determine in view of the uncertainty of the trend in total milk consumption and in the number of routes that may be operated. Wage rates paid delivery labor after the war probably will not decrease to any appreciable extent for some time. A return to daily delivery and other prewar practices therefore would increase considerably the cost of milk delivery because of a reduction in size of loads, less efficient use of labor, and increased mileage. However, the consumption of milk and cream may not drop to the prewar level if wages are maintained and business conditions result in a fair level of employment. The present saving in retail delivery costs, as compared with the cost if based on prewar efficiency at prevailing wage rates, is 0.89 cent per quart of milk in Boston and 0.74 cent in Portland. In addition, the present reduction in mileage amounts to a saving of 0.2 cent per quart in making retail deliveries.⁹ The combined savings in man labor and motor truck costs is approximately 1 cent a quart as compared with what the cost would have been under prewar conditions adjusted for present wage rates.

For wholesale routes, a return to prewar conditions, under existing wage rates, would have a considerably less effect on delivery costs than in the case of retail routes. The estimated saving in labor cost in making wholesale deliveries, assuming the same

⁹Dow, George F. Consumers' Problems of Every-Other-Day Delivery of Milk in Portland and Westbrook, Maine. Me. Agr. Exp. Sta. Misc. Publ. No. 571. January 1943.

labor efficiency and size of load as in October 1941, is only 0.03 cent per quart of milk in Boston and 0.28 cent in Portland. Some saving also is made in motor truck costs. There is some question, however, as to whether a return to Sunday delivery might not involve more additional cost than the savings estimated above for Boston, due to adjustments that might be necessary in wage rates and labor requirements. There also is a need for further study as to what effect the elimination of Sunday delivery has had on plant costs, due to having to handle extra volume for Saturday delivery.

From the above figures it is apparent that a return to prewar conditions would materially increase retail delivery costs and probably would have a somewhat less but a significant effect on the costs for wholesale delivery. The relative importance of each of the various wartime practices in contributing to the increased efficiency in milk delivery was not determined in this study. However, some information is available from several other studies that may give an indication of the importance of various practices.

The adoption of every-other-day delivery on retail routes has been without doubt the most important factor influencing the wartime increase of efficiency in milk delivery. Mileage requirements on retail routes have been reduced 35 to 40 per cent under every-other-day delivery, according to studies in Portland, Maine,¹⁰ Ithaca, New York,¹¹ Upstate New York,¹² and Connecticut markets.^{13, 14} In Upstate New York, every-other-day delivery, in addition to a 35 per cent decrease in mileage, resulted in a 12 per cent reduction in the number of routes, a 9 per cent reduction in the number of routemen, and a 15 per cent reduction in the time

¹⁰ Same reference as in footnote 9.

¹¹ Anderson, Roice and Spencer, Leland. *Ways of Conserving Tires and Reducing Other Expenses in the Distribution of Milk*. Cornell Dept. Agr. Econ., A. E. 386. January 1942.

¹² Spencer, Leland and Johnson, Stewart. *Changes in Milk Delivery in Upstate New York*. Cornell Dept. Agr. Econ., A. E. 400. September 1942.

¹³ Bressler, Jr., R. G., Anderson, E. O., Clarke, Jr., D. A., Bilenker, E. N. *Efficiency of Milk Marketing in Connecticut: 5. Economics and Biology of Alternate-Day Milk Delivery*. Storrs Agr. Exp. Sta. Bul. 247. May 1943.

¹⁴ Bressler, Jr., R. G., Clarke, Jr., D. A., Seaver, S. K. *Efficiency of Milk Marketing in Connecticut: 9. Conservation Possibilities in Retail Delivery in Major Markets*. Connecticut Agricultural Experiment Station Bul. 253. August 1944.

spent on the route. In the Connecticut markets, a reduction of 44 per cent in mileage travelled on retail routes (due to every-other-day delivery and the elimination of special deliveries), along with increased deliveries per stop has reduced route time by 30 per cent, thus making possible increased loads and some consolidation of routes. The total savings from every-other-day delivery in Connecticut was estimated to be 1.32 cents per quart if based on the same wage rates as for daily delivery.

In Columbus, Ohio, the effects of every-other-day delivery, combined with other wartime practices, reduced the number of routes operated by 40 per cent and the number of drivers employed by 21 per cent. In Canton, Ohio, where there was some increase in milk sales, the number of routes was reduced 35 per cent and the number of drivers 25 per cent. In Dayton, Ohio, where milk sales increased rapidly, the reduction was only 5 per cent in the number of routes and 2 per cent in the number of drivers.¹⁵ In Sacramento, California, the trend on retail routes, from September 1939 to May or June 1944, was a 77 per cent increase in the number of packages delivered per route, which reduced the delivery time required per package by 43 per cent. This increase in efficiency more than offset the 25 per cent increase in wage rates and resulted in a 10 per cent reduction in delivery labor costs, which were reduced from 2.14 to 1.93 cents per package.¹⁶

Milk distributors in the larger markets have expressed a nearly unanimous approval for the continuation of every-other-day delivery on retail routes after the war. A survey by Western Dairy Products News Service, including 371 handlers, showed that 97 per cent did not want to return to daily delivery unless forced by competition.¹⁷ The International Association of Milk Dealers has reported that 92 per cent of all members replying considered that every-other-day delivery on retail routes was a desirable postwar practice.¹⁸ All of the milk dealers replying in Burlington, and

¹⁵ McBride, C. G. Effects of Every-Other-Day Milk Delivery in Columbus, Canton, and Dayton. Ohio Exp. Sta. Bimonthly Bul. July 1943.

¹⁶ Marshall, Jr., John. A Study of Wholesale and Retail Route Operations of Fluid Milk Distributors Located in the Alameda-Contra Costa, Los Angeles, Sacramento, San Diego, and San Francisco Marketing Areas. Bur. of Market Enforcement. California Dept. Agr. September 1944.

¹⁷ Western Dairy Products News Service. October 10, 1944.

¹⁸ News Letter, International Association of Milk Dealers. November 7, 1944.

nearly all in Rutland (Vermont's two largest cities) favored a continuation of every-other-day delivery; but in the smaller markets many did not favor continuation.¹⁹ In New York City, 89 per cent of the distributors favored continuation of every-other-day retail delivery.²⁰ Statements by representatives of two of the largest distributors in Boston are as follows: "Our wartime practice of every-other-day delivery has been the most important economy ever introduced in the distribution of milk"²¹; and "The advantages... are so great that every-other-day delivery will be a MUST in our postwar planning."²²

The elimination of callbacks and special deliveries has been another important factor directly affecting the efficiency of milk delivery. In Portland, Maine, special deliveries before the war represented a duplication of 6.7 per cent of the total route mileage covered by three of the largest distributors. The volume of these special deliveries averaged only 0.8 quart of milk and 0.04 quart of cream per mile travelled.²³ In Ithaca, New York, callbacks and special deliveries accounted for 11.3 per cent of the total mileage travelled, and 5.5 per cent of the deliveryman's time spent in all operations.²⁴ In Upstate New York markets, the elimination of special deliveries and callbacks caused a reduction of 7 per cent in mileage, in addition to the 35 per cent reduction due to every-other-day delivery.²⁵ On the wholesale routes in these markets, the total mileage was decreased 16 per cent in spite of a 5 per cent increase in the number of wholesale routes. In Columbus, Ohio, the milk dealers estimated that 5 to 15 per cent of the savings from

¹⁹ Adams, Thurston M. Preliminary information received in April 1945, based on a survey made in June 1944 by the Vermont Agr. Exp. Sta.

²⁰ Spencer, Leland. Views of New York Milk Distributors Concerning Continuation of Wartime Limitations on Delivery Services After the War Ends. Cornell Dept. Agr. Econ., A. E. 508. January 1945.

²¹ Paper presented by Ezra Merrill of H. P. Hood and Sons at Milk Plant Session, Burlington, Vermont. November 9, 1944.

²² Burns, Robert A., Whiting Milk Company, Boston, Mass. Our Experience With EOD Delivery. The International Association of Milk Dealers, Assn. Bul. No. 9. June 13, 1944.

²³ Dow, George F. An Economic Study of Milk Distribution in Maine Markets. Me. Agr. Exp. Sta. Bul. 395. March 1939.

²⁴ Same reference as in footnote 11.

²⁵ Same reference as in footnote 12.

wartime practices affecting retail deliveries were due to the elimination of callbacks and special deliveries.²⁶

Daylight delivery on retail routes has been an important development that made it practical to eliminate callbacks to collect money from customers. The later morning delivery also gives consumers a better opportunity to obtain extra supplies of milk and cream when needed, without having a second delivery. Most deliverymen also prefer daylight working hours.

Deposit charges on bottles delivered to stores have long been recognized by Boston and Portland dealers as desirable in order to reduce bottle losses. A five-cent bottle deposit on wholesale trade has been required by the State Milk Control Boards for a considerable time prior to the war, and probably will be continued in the postwar period.

The elimination of returns of milk and cream from stores, when not sold on the previous day, does not appear to involve undue hardship on the part of stores, and does not appreciably affect the quality of the product. In a prewar survey at Portland, about three-fourths of the storekeepers reported that milk was not kept at stores more than one day; and one-fourth said not over two days.²⁷ The average amount of milk returned to the distributor was only 2.5 per cent of the total. The stores that were not open on Sunday, so as to sell the remainder of Saturday's milk, were the greatest problem. They returned an average of 3.1 per cent of their milk as compared with 2.0 per cent for those that kept open every day. About one-third of the storekeepers kept cream for a maximum of two days, and an additional one-tenth kept cream for three to four days before returning the unsold remainder to the dealer. The average amount of cream returned was 7.4 per cent of the total. When milk was not all sold by the end of the day, it could be sold first the next morning so that milk usually was not held in the store for more than 24 hours.

A summary of a recent survey of New York City distributors, showing the percentage that favored continuation of various wartime practices, is given below:²⁸

²⁶ Keith, Karl M. and McBride, C. G. Effect of Every-Other-Day Delivery on Milk Purchases in Columbus, Ohio. Ohio Agr. Exp. Sta., Dept. Rural Economics, Mimeographed Bul. No. 162. May 1943.

²⁷ Dow, George F. Milk Distribution Through Stores in the Portland Market. Me. Agr. Exp. Sta. Misc. Publ. No. 574. July 1943.

²⁸ Same reference as in footnote 20.

Wartime practice	Per cent favoring for	
	Retail deliveries	Wholesale deliveries
Every-other-day retail service	89	xxx
6-day wholesale service	xxx	92
Daylight operation	69	86
Ban on special deliveries	86	93
Ban on callbacks	76	88
Advance orders by customers	73	88
Ban on pint bottles	75	xxx
Limitation on cream grades	53	71
Ban on returns from stores	xxx	100
Required deposits on bottles	xxx	100

The following quotation is taken from the New York report:

"The questionnaire survey reveals that a great majority of the milk distributors in New York City and adjacent suburban areas would like to continue after the war such economical practices as every-other-day service to retail customers and 6-day service to wholesale customers. They would like to avoid any return to free special deliveries and the use of pint bottles. It is generally conceded that competition for business will bring about reinstatement of the more expensive prewar services unless some form of regulation by state or federal authorities is applied.

"With higher wages in effect than before the war, resumption of prewar delivery services would mean a sharp increase in costs—probably between 1 and 2 cents a quart. Distributors are not optimistic about the willingness of producers and consumers to share these higher costs, especially if the federal subsidy of more than 2 cents a quart should be reduced or eliminated at the same time. So they are ready to accept, or even to encourage, peacetime regulation of delivery services in order to preserve the savings brought about by wartime restrictions."

CONSUMER ACCEPTANCE OF EVERY-OTHER-DAY DELIVERY AND OTHER WARTIME PRACTICES

Every-other-day delivery has been readily acceptable to most consumers, at least as a wartime measure. Consumers also may be willing to continue this practice after the war if they are acquainted with the fact that a return to daily delivery would increase the cost of milk delivery by one cent per quart. A survey in Provi-

dence, Rhode Island, showed that only three per cent of the families were dissatisfied with every-other-day delivery.²⁹ Eleven per cent, however, were willing to accept this practice as a necessary war measure, but not after the emergency was over. (This question, however, did not involve consideration of an increase in price if every-other-day delivery were discontinued.)

In Portland, consumers were not seriously inconvenienced by every-other-day delivery, nor had the keeping quality of milk been seriously affected.³⁰ The quality of milk delivered on this basis was approximately equal to that purchased daily at stores. All but five per cent of the 966 families interviewed had refrigerators. Refrigeration space was adequate for handling a double quantity of milk delivered every-other-day except for four per cent of the families where limited space was a problem.

In Columbus, Ohio, only 45 out of 505 housewives interviewed reported changes in milk buying plans, and only 7 shifted all their purchases from home delivery to stores.³¹ Only 23 reported inadequate refrigeration space, 11 had difficulty in keeping track of delivery days, 8 had a problem in keeping milk fresh, 8 ran out of milk, 7 found late delivery to be inconvenient, 5 said it was a nuisance, and 2 tended to overstock. Another study in Ohio reported that the housewife accepted cheerfully the change to every-other-day delivery, and the inconvenience was not sufficient to induce her to change buying plans.³² An additional study in cooperation with the Junior Women's Club of Coshocton, Ohio, found that 81 per cent of the families would be satisfied with every-other-day delivery on retail routes after the war, and 84 per cent of the regular cream purchasers were willing to have but one type weight (30 per cent butterfat) for cream.³³

In Connecticut, it was found that when milk was stored in mechanical or ice refrigerators, its condition remained satisfactory for at least two days.³⁴ In mechanical refrigerators, most samples remained in good condition for the four-day testing period.

²⁹ Kettle, D. I. and Tennant, J. L. Every-Other-Day Delivery of Milk. Rhode Island Agr. Exp. Sta. Misc. Publ. No. 15. December 1942.

³⁰ Same reference as in footnote 9.

³¹ Same reference as in footnote 26.

³² Same reference as in footnote 15.

³³ Report on the Agricultural Experiment Stations, 1944, p. 109. U. S. Dept. Agr., Agricultural Research Administration.

³⁴ Same reference as in footnote 13.

In Vermont, a survey of 1150 housewives indicated that nearly 80 per cent would be willing to continue every-other-day delivery after the war if they could save up to a cent a quart.³⁵ If no saving were made, nearly one-half would prefer daily delivery due in part to rather crowded refrigeration space.

Daylight delivery of milk also has proven to be satisfactory to most consumers in respect to both convenience and keeping quality of the milk. A prewar study in Portland indicated that the most satisfactory time was from 6:00 to 8:00 a.m.³⁶ The most unsatisfactory time was before 6:00 a.m. because milk sometimes froze in winter or became too warm in summer before the consumer was up to take in the milk; also the consumer's slumber was sometimes disturbed by early morning delivery. Delivery after 8:00 a.m. did not have any appreciable effect on the keeping quality of milk, but some consumers preferred earlier delivery in order to have fresh milk for breakfast. A very few consumers found late delivery to be unsatisfactory because no one was home at the time of delivery to put the milk into the refrigerator. Only 13 per cent of the families receiving milk after 8:00 a.m. had any objection to the time of delivery, and these objections usually were not serious.

SUMMARY AND CONCLUSIONS

Most consumers and some distributors have been assuming that retail routes would again operate on a daily delivery basis after the war. Attention, however, now is being focused upon what effect a return to daily delivery and other prewar practices would have on the efficiency and cost of delivering milk. This question is of importance to milk distributors if they are to continue to operate at existing margins. Farmers also have an interest in efficient distribution because of its importance in stimulating increased milk consumption and in maintaining satisfactory milk prices. Deliverymen also prefer every-other-day delivery because of shorter hours of work or greater weekly earnings. Consumers are interested in obtaining a high quality product at a lower price than would be possible under prewar delivery practices.

This study has shown that the adoption of wartime practices,

³⁵ Same reference as in footnote 19.

³⁶ Same reference as in footnote 9.

along with an increase in milk consumption, has resulted in a marked increase in the efficiency in the use of delivery labor on milk routes. The volume of dairy products delivered per man has increased 34 per cent on the retail routes of Boston and Portland distributors from October 1941 to October 1944. The labor efficiency on wholesale routes increased 4 per cent at Boston and 35 per cent at Portland. There were also some savings made in motor truck costs as a result of every-other-day delivery and the elimination of callbacks and special deliveries.

This increase in the efficiency of the use of delivery labor was nearly sufficient to offset the substantial increase in wage rates paid deliverymen. This was important in view of the fact that wage rates paid retail route drivers increased 38 per cent at Boston and 44 per cent at Portland. The result was a net increase in delivery labor costs, per point of product handled, of only 4 per cent for the retail routes at Boston and 7 per cent at Portland. For wholesale routes, the net increase in delivery labor costs was only 11 per cent at Boston and 1 per cent at Portland.

This study shows only the wartime changes in milk delivery, without considering the entire cost of milk distribution including the increase in plant costs for labor and supplies. On delivery routes, however, the savings have been substantial and have helped materially in making it possible for distributors to operate without an increase in margin, in spite of increased wage rates for labor.

Wage rates presumably will not decrease appreciably, at least for some time after the end of the war. Consequently if there is a return to daily delivery and other prewar practices, resulting in labor efficiency and size of loads as low as in October 1941, there will be an increase in delivery costs. The extent to which delivery costs would increase also would depend to some extent upon the trend in per capita consumption. However, the increase in labor costs on retail routes, under existing wage rates, would amount to 0.89 cent per quart of milk in Boston and 0.74 cent in Portland if size of loads and labor efficiency should decrease to prewar levels. Motor truck costs on retail routes also would be increased, resulting in an additional cost of 0.2 cent per quart of milk. The combined effect on labor and motor truck costs would be an increase of at least one cent per quart of milk.

Many milk distributors, especially in the larger markets, are in favor of continuing after the war the practice of every-other-day

delivery and some of the other more practical wartime procedures. Consumers in general have accepted readily the every-other-day delivery of milk, and presumably will be willing to continue this practice if they are assured of saving at least one cent per quart. A list of wartime practices to be continued in the postwar period has been recommended by the Committee of Milk Distribution Efficiency of the Northeastern Dairy Conference:

1. Every-other-day delivery to homes
2. No Sunday delivery to wholesale customers
3. No special deliveries or callbacks
4. Daylight delivery on retail routes, except where congested daytime traffic makes this impractical
5. Continued limitation on the number of different items carried on delivery routes
6. No pint containers to be used for retail milk sales
7. Deposit charges on all glass bottles delivered to wholesale customers
8. No return of milk and cream from stores

It is recognized that a continuation of each of these practices may not be desirable in all markets. Nevertheless, each practice has worthwhile merits that should receive consideration in developing future plans for milk distribution.

APPENDIX TABLE 1

Average Daily Load on Retail Routes of 8 Distributors in Boston and 4 in Portland, During October 1941

Product sold and size of container	Number of container units delivered daily per route in:					
	Boston			Portland		
	Retail sales	Whole- sale	All sales	Retail sales	Whole- sale	All sales
Milk:						
Quarts	271.4	10.1	281.5	239.9	16.1	256.0
Pints	2.2	1.1	3.3	42.3	2.1	44.4
½ quarts	—	1.8	1.8	—	.8	.8
½ pints	.6	12.8	13.4	—	21.5	21.5
Bulk (qts.)	—	3.8	3.8	—	3.5	3.5
Total milk	274.2	29.6	303.8	282.2	44.0	326.2
Chocolate milk:						
Quarts	1.5	—	1.5	2.5	.4	2.9
Pints	—	—	—	.4	—	.4
½ quarts	—	—	—	—	1.3	1.3
½ pints	.5	4.6	5.1	.3	4.1	4.4
Total choc.	2.0	4.6	6.6	3.2	5.8	9.0
Cream:						
Quarts	.3	.9	1.2	.1	1.1	1.2
Pints	10.2	.6	10.8	2.7	1.0	3.7
½ pints	13.2	1.5	14.7	13.8	1.6	15.4
Bulk (qts.)	—	1.5	1.5	—	1.1	1.1
Total cream	23.7	4.5	28.2	16.6	4.8	21.4
Skim milk:						
Quarts	.3	—	.3	2.1	—	2.1
Bulk (qts.)	—	.1	.1	—	.6	.6
Buttermilk:						
Quarts	1.8	—	1.8	2.3	.3	2.6
Bulk (qts.)	—	.2	.2	—	.2	.2
Cottage cheese:						
Lbs. or pkgs.	3.2	.2	3.4	2.6	.2	2.8
Butter, pounds	4.1	.8	4.9	—	—	—
Eggs, dozens	.6	—	.6	1.4	.8	2.2
Other products*	.3	.6	.9	—	—	—
Total misc.	10.3	1.9	12.2	8.4	2.1	10.5
Total units all products	310.2	40.6	350.8	310.4	56.7	367.1
Total points†	310.2	18.9	329.1	310.4	27.0	337.4

* Includes pounds of bacon and sausage, quarts of ice cream and ice cream mix, and packages of chocolate syrup, cocoa marsh, orange juice, and tomato juice.

† One point for each container unit to retail customers and one-half point for each unit to wholesale customers, with the exception of wholesale deliveries in bulk which were one-fourth point per quart.

APPENDIX TABLE 2

*Average Daily Load on Wholesale Routes of 8 Distributors in Boston and 4 in Portland During October 1941**

Product sold and size of container	Point values per unit	Average volume delivered daily per route			
		No. of container units		Number of points	
		Boston	Portland	Boston	Portland
Milk:					
Quarts	1.0	561.4	291.8	561.4	291.8
Pints	.5	38.4	77.2	19.2	38.6
½ quarts	.5	199.6	136.7	99.8	68.4
½ pints	.5	345.1	425.3	172.6	212.6
Bulk (qts.)	.4	342.4	163.7	137.0	65.5
Total milk		1486.9	1094.7	990.0	676.9
Chocolate milk:					
Quarts	1.0	.3	4.1	.3	4.1
Pints	.5	5.5	.2	2.8	.1
½ quarts	.5	.7	29.0	.4	14.5
½ pints	.5	54.7	55.8	27.4	27.9
Bulk (qts.)	.4	.9	—	.4	—
Total choc.		62.1	89.1	31.3	46.6
Cream:					
Quarts	1.5	15.0	19.2	22.5	28.8
Pints	1.0	36.8	2.9	36.8	2.9
½ pints	1.0	56.5	43.7	56.5	43.7
Bulk (qts.)	.6	115.1	51.3	69.1	30.8
Total cream		223.4	117.1	184.9	106.2
Skim milk:					
Bulk (qts.)	.4	5.0	43.9	2.0	17.9
Buttermilk:					
Quarts	1.0	2.6	3.3	2.6	3.3
½ pints	.5	1.6	5.5	.8	2.8
Bulk (qts.)	.4	8.0	9.3	3.2	3.7
Cottage cheese:					
Lbs. or pkgs.	1.0	5.7	10.5	5.7	10.5
Butter, pounds	1.0	12.2	21.0	12.2	17.4
Eggs, dozens	1.0	1.0		1.0	
Other products	†	19.5		16.5	
Total misc.		55.6	93.5	44.0	55.6
Total all products		1828.0	1394.4	1250.2	885.3

* Daily volume is computed on the basis of seven days per week, although Sunday deliveries were eliminated by making extra deliveries on Saturday.

† One point per package except for ice cream mix which was 0.6 point per quart.

APPENDIX TABLE 3

*Average Daily Load on Wholesale Routes in October 1944, and Trend from 1941-44, Based on Six-Days-a-Week Delivery in 1944**

Item	Daily average in 1944, based on 6-days-a-week delivery			Per cent trend based on daily delivery in 1941 and 6-days-a-week in 1944		
	Boston	Port- land	Upstate New York	Boston	Port- land	Upstate New York
Qts. per route daily:						
Milk	1249	1127	939	+14	+67	†
Cream	134	70	37	-18	-16	†
Number of points per route daily	1553	1249	1257	+24	+41	+44
Number of points per man daily	989	932	1241	+22	+58	†
Labor earnings per route daily	\$12.50	\$9.79	\$9.38	+38	+44	+55

* An explanation of various terms is given in the footnotes below table 12.

† Information was not available.

POULTRY

The poultry industry in Maine has expanded rapidly during the war period. The annual income from poultry products is approximately twenty-two million dollars and is second only to the income from the potato crop. The following reports indicate the progress being made on various studies in the Station's research program.

ECONOMICS OF THE INDUSTRY

MARKETING OF HATCHING EGGS AND BABY CHICKS.¹ George F. Dow. Marketing developments in Maine were determined by a questionnaire returned by 211 poultrymen during the summer of 1944.

The layers kept by Maine poultrymen producing hatching eggs during 1943-44 were 42 per cent Rhode Island Red, 31 per cent New Hampshire, 24 per cent Barred Plymouth Rock, 2 per cent White Plymouth Rock, and 1 per cent miscellaneous. Broiler Cross hatching eggs represented nearly three fourths of the Rhode Island Red hatching eggs, and nearly two thirds of the New Hampshires. Sex Linked hatching eggs included about two thirds of the sales from B. P. Rock layers.

A considerable change in the breed of layers to be kept during 1944-45 was expected. About one fifth of the R. I. Red producers planned to change all or part of their layers to New Hampshire or B. P. Rock. The number of flocks keeping some New Hampshires was expected to have a net increase of about one fourth; and the number having B. P. Rock was to increase about one tenth. The net change in the number of layers for each breed from 1944-45 (assuming no change in total layers) was a 14 per cent decrease in R. I. Reds, and 11 per cent increase in New Hampshires, and a 10 per cent increase in B. P. Rocks.

Most of the shift expected in the types of layers was due to the increased demand either for Sex Linked eggs for market-egg flock replacements, or for Broiler Cross strains that feathered quicker

¹ More details are available in Miscellaneous Publication 600, with same title as above.

and matured faster. A few producers, however, who in 1943-44 kept layers especially selected for broiler production, were dissatisfied with the low egg production per layer and were planning to change back to higher egg producing strains. In selecting a new strain of layers for broiler production purposes, care should be taken not to reduce appreciably a high rate of egg production in attaining early maturity and fast feathering of the chicks.

Considerable seasonal variation existed in sales of hatching eggs among the various breeds. The sale of Sex Linked eggs from flocks of B. P. Rock layers was seasonally high during the winter and spring due to the demand for replacement stock in flocks of market egg producers. During the summer and fall, however, such eggs were in little demand and the layers were remated to produce straight B. P. Rock eggs to supply the broiler trade.

Many hatching egg producers in Maine ship to out-of-State hatcheries, and must meet their specifications if an adequate market outlet is to be available. During the year 1943-44 total hatching egg sales were only 16 per cent to Maine hatcheries, 16 per cent were shipped to New Hampshire, 26 per cent to Connecticut and Massachusetts, 38 per cent to Delaware, Maryland, Virginia, Pennsylvania, and New Jersey, and 4 per cent to states further south. The proportion sold to Maine hatcheries was 4 per cent of the N. H. Broiler Cross, 11 per cent of the R. I. Red Broiler Cross, and about one fourth of all the Straight Red, Straight New Hampshire, Straight Rock, and Sex Linked hatching eggs.

In the sale of hatching eggs, nearly all producers were paid on the basis of a premium over the Boston quoted price per dozen for large eggs. In addition, the hatcheries customarily paid the transportation cost so that express and trucking rates were not deducted from the producer's price of eggs. The average price premium received during the year ending June, 1944, was 25.7 cents per dozen, which was considerably more than the prewar premium of about 15 cents. This premium varied considerably by seasons, reaching a peak during the summer and fall of 1943 when egg production was seasonally low and the broiler demand was unusually strong.

Differences in breeds caused some variation in hatching egg premiums. The Sex Linked eggs brought the highest premium during the spring, averaging 25.0 cents as compared with 22.4 cents for all breeds and 20.5 cents for Broiler Cross eggs. During the winter months, the Sex Linked eggs also brought the top price with

the exception of Straight New Hampshires. During the summer and fall, however, Broiler Cross eggs brought the best premiums.

Heavy returnable wooden cases were used for shipping 86 per cent of all hatching eggs, lightweight wooden cases for 10 per cent, and lightweight fibre cases for only 4 per cent of the eggs. Only 12 per cent of all producers used the lighter cases regularly and most of these producers shipped eggs by trucks, either to a hatchery in Maine or to a buyer in New Hampshire. Only 10 per cent of the lighter cases that were used during the year were purchased as new cases; 90 per cent were obtained as secondhand cases. All cases held 30 dozen eggs per case.

Railway express carried 86 per cent of the hatching eggs shipped by Maine producers during the year ending June, 1944. Wartime conditions have caused some problems in the transportation of eggs because of a shortage of competent help and less care in handling. During the war period, there have been frequent complaints from producers as to the rough handling of both the full and empty cases. Consequently, there is a loss involved in broken eggs, the purchase of additional cases, and the extra expense and time required in repairing and cleaning cases.

The average incubator capacity was 15,831 eggs for the 71 Maine hatcheries included in the 1944 survey, as compared with 14,492 for the entire group of 132 hatcheries in Maine. Most of the hatcheries were relatively small in size, with 59 per cent having a capacity of less than 10,000 eggs, and only 8 per cent having a capacity of 40,000 or more eggs. The largest hatchery had a capacity of 182,000 eggs. The incubators, at the 57 hatcheries where baby chicks were sold, were utilized to full capacity a total of 5.6 times during the year. This total included an average of 4.2 times during the six months period of January-June, and 1.4 times during July-December. In the larger hatcheries, incubator capacity was used considerably more efficiently than in the smaller ones. Those with 30,000 or more capacity were used an average of 6.8 times as compared with only 2.5 times for those with less than 5,000 capacity. The greater efficiency was the result of more complete utilization during both January-June and July-December. In the smaller hatcheries, only 6 per cent of the chicks were hatched during July-December as compared with 20 per cent in the medium size hatcheries, and 31 per cent in the larger hatcheries.

The average hatchability of eggs was 72.4 per cent for the year

ending June, 1944. The highest rate of hatchability reported was 80 to 82 per cent, for nine hatcheries.

The breeds of chicks hatched in Maine during the year ending June, 1944, included 28 per cent Rhode Island Red, 26 per cent Broiler Cross, 22 per cent Sex Linked, 15 per cent New Hampshire, and 9 per cent Barred Plymouth Rock. Approximately three fourths of all chicks were hatched during January-June, and only about one fourth during July-December. The proportion hatched during July-December varied considerably by breeds, comprising only 7 to 12 per cent of the breeds hatched primarily for flock replacement purposes such as the R. I. Red, New Hampshire, and Sex Linked chicks. In contrast, nearly one fourth of the B. P. Rocks and two thirds of the Broiler Cross chicks were produced during July-December. These two breeds are in much more demand in the broiler trade, which in recent years has tended to be a year round business.

Most of the chickens hatched in Maine are sold to Maine poultrymen in nearby areas. Fifty-two per cent of all chicks hatched were sold to Maine poultry producers and 5 per cent more were kept for the hatcheryman's own flock replacement. An additional 14 per cent were sold to Maine live poultry dealers, and 4 per cent to Maine grain dealers. Out-of-State shipments included 24 per cent of all chicks, comprising 6 per cent to poultrymen and 18 per cent to commercial broiler producers. The remaining 1 per cent of the chicks were cockerels that were drowned or gassed because of lack of a market.

In recent years, the demand for sexed chicks has increased rapidly, especially among the poultrymen who raise their flock replacements. The proportion of all chicks that were sexed averaged 49 per cent for all breeds during 1943-44. The extent of sexing varied considerably among breeds, averaging 83 per cent for Sex Linked, 54 per cent for R. I. Red, 37 per cent for New Hampshire, 25 per cent for B. P. Rock, and 5 per cent for Broiler Cross chicks.

The average price received for baby chicks sold during January-June, 1944 was 15.8 cents for straight run chicks, 25.2 cents for pullets, and 8.4 cents for cockerels. These prices are per chick, sold in lots of less than 100 chicks. A quantity discount in price was reported by about one half of the hatcherymen in the sale of

lots of approximately 1,000 or more chicks. The discount was one cent per chick for two thirds of these hatcheries.

COSTS AND RETURNS IN THE PRODUCTION OF BROILERS IN MAINE. Alvah L. Perry. The production of commercial broilers has increased greatly in Maine especially since the beginning of World War II. One of the factors responsible for this increase has been the favorable price for poultry meat. Another factor contributing to increased broiler production was the rise of contract and partnership arrangements where poultrymen with brooding facilities could raise large numbers of broilers without assuming great financial risks. In this study not only commercial broiler raisers were included but also poultrymen who raised chickens for meat along with laying flock replacements.

On only one fifth of the 170 farms interviewed in 1944 was the broiler enterprise the only source of farm income. However, the gross farm income from broilers was of first importance on 42 per cent of the farms, second on 37 per cent and less important on 21 per cent of the farms contacted. Two fifths of the farm operators had 20 years or more of farm experience but only one fifth had raised broilers for more than 10 years.

The investment in equipment and buildings for the broiler enterprise amounted to an average of \$825 per farm. This represented an average investment per broiler started of 23.3 cents. Production costs averaged 24.3 cents per pound. This figure included the cost for baby chicks, feed, labor, fuel, litter, building and equipment costs, and other miscellaneous items. The cost of feed, baby chicks, and labor amounted to 91.3 per cent of the total costs of production. The average profit per pound of meat produced was 4.8 cents. Labor return amounted to 32 cents per bird raised and \$1.40 per hour of labor expended on the broiler enterprise.

Many factors affected the costs of production and thus the profits from the broiler enterprise. Important among these factors were breeds, size of lots, weight at sale, use of range, number per stove, and mortality. Broiler Cross chicks made greater rates of gain and consumed less feed per pound of meat produced than other breeds. A large number of chickens per lot was inductive to larger profits per bird because of the greater labor efficiency than with small lots. Chickens sold at a weight of 4.5 to 4.9 pounds gave producers the greatest profit per pound and greatest return per hour of labor. Birds raised on range were more profitable than

those raised in confinement. The number of birds to start per stove was largely dependent on the amount of floor space available. If adequate floor space was provided, 400 to 600 birds per stove could be brooded satisfactorily. As mortality increased above 10 per cent, profits decreased. At a rate above 25 per cent, profits ceased and losses occurred.

There did not appear to be any significant relationship between the method of feeding and feed consumption per pound of meat produced. Twenty per cent of the lots of chickens were fed all mash ration and 80 per cent were fed mash and scratch. Of all feed used for broilers, 73 per cent was mash, 23 per cent mixed scratch grains, 2 per cent was corn, 1 per cent each wheat and pellets, and 0.2 per cent was fine chick grain.

Coccidiosis was the most important poultry disease, accounting for 42 per cent of all chicken deaths and for over one half of the death loss by poultry diseases. Crowding and the purchase of weak chicks from hatcheries were also important causes of broiler deaths. Nutritional diseases, bronchitis, and colds were important on individual farms but were not responsible for a very large proportion of the total mortality on all farms. The death loss by animals, primarily by foxes and rats, amounted to 8 per cent of the total death loss.

Practically all the broilers raised were sold at the farm alive. Three fourths of the broilers handled by live poultry dealers were dressed in local dressing plants and one fourth were trucked alive to terminal markets. In 1943 less than one half the chickens marketed in Maine were dressed in local plants. In 1944 nearly 85 per cent of the broilers were marketed in Massachusetts, primarily for the Boston trade, 13 per cent were marketed in Maine, and 2 per cent were trucked to New York City. Seventy-three per cent of the broilers marketed in Massachusetts and 93 per cent of those marketed in Maine were dressed whereas all the broilers marketed in New York City were alive.

Maine poultry buyers expressed preference for chickens weighing over 4 pounds and for those with yellow skins. Broiler Crosses and "Rocks" were considered the best breeds, but buyers emphasized that quality rather than breed was the determining factor for prices paid. The flock needs to be healthy and well feathered to command highest prices.

Prices paid farmers for chickens vary not only from year to

year but usually from one season to another during any one year. The variation in prices from one year to another is greatly influenced by the level of wholesale prices of all commodities, the purchasing power of the people, and the eating habits of the consumers. Seasonal variation in prices is influenced largely by seasonality of production and cold storage holdings of poultry meat. Wholesale prices of chickens also vary by sizes of chickens marketed.

FEEDING AND MANAGEMENT

Although there are a number of problems related to poultry feeding and management that are of importance to the poultry industry, only a limited number are under investigation at this time. The following are preliminary reports of the projects in progress during the fiscal year, 1944-45.

METHODS OF STARTING CHICKS AS RELATED TO PASTING, MORTALITY, AND GROWTH. J. Robert Smyth. Chicks frequently develop a trouble known as "pasting" within a week after being brooded. This condition is the result of feces accumulating on the down around the vent and may be severe enough to plug the vent in some cases.

Two tests of eight groups of forty, and one test of eight groups of twenty-five, Rhode Island Red chicks were started with the two lots fed in each of the following ways: (1) Mash; (2) scratch grain for one day, then mash; (3) scratch grain for two days, then mash; and (4) scratch grain for three days, then mash. The chicks were individually weighed at time of brooding, one week later and then each two weeks until they were five weeks of age.

Pasting. The following table shows the amount of pasting in the chicks of the three lots:

Method of feeding	Total No. chicks	Severe Pasting		Slight Pasting		No Pasting	
		No. chicks	Per cent	No. chicks	Per cent	No. chicks	Per cent
Mash	210	20	9.5	44	20.9	146	69.5
Scratch 1 day	210	2	.9	16	7.6	192	91.4
Scratch 2 days	210	5	2.4	5	2.4	200	95.2
Scratch 3 days	210	3	1.4	4	1.9	203	96.6

Mortality. The following table shows the mortality in the three lots up to five weeks of age:

Method of feeding	Severe Pasting		Slight Pasting		No Pasting	
	No. chicks	No. dead	No. chicks	No. dead	No. chicks	No. dead
Mash	20	2	44	0	134	8
Scratch 1 day	2	1	16	0	174	9
Scratch 2 days	5	1	5	0	191	8
Scratch 3 days	3	0	4	0	190	9

Growth. The gain in weight in grams for each lot of chicks from one week to five weeks of age was as follows:

Method of Feeding	All Chicks	Severe Pasting	Slight Pasting	No Pasting
Mash	187.2	189.7	192.9	183.6
Scratch 1 day	199.0	214.0	184.5	199.5
Scratch 2 days	185.0	224.0	207.0	184.3
Scratch 3 days	204.0	215.0	225.0	203.6

These data indicate that most pasting can be eliminated by feeding scratch grain for from one to three days before starting mash. There was only a very slight advantage for the feeding of scratch for two days as compared to one day and practically no advantage in the feeding of scratch for three days as compared to two. The feeding of scratch grain for from one to three days did not affect mortality or gain in weight from one week to five weeks of age. There was some evidence that the largest, fastest growing chick shows a greater tendency to paste. It is possible that this type of chick eats more mash during the first few days.

SECOND CUTTING LADINO CLOVER AND TIMOTHY AS A SUBSTITUTE FOR ALFALEA LEAF MEAL IN POULTRY RATIONS. J. Robert Smyth, Bernie E. Plummer, Jr. Due to a very poor growing season in 1944, it was impossible to get second crop ladino hay either sun cured or dehydrated. Four barrels of good quality silage were made and this was used in one test during 1945. In making the silage no preservative was used. The clover was wilted in the field, cut with a silage cutter and packed in clean, 50-gallon molasses barrels. There was practically no loss from spoilage, other than on top of each of the barrels, until about April 5, when one barrel

was practically used up. The last barrel became moldy about May 1st and feeding was discontinued at that time.

Analyses. The carotene content of the silage and alfalfa leaf meal used in the feeding trial was as follows: The first test made on the silage January 11, showed 218 ppm on a moisture-free basis. A sample from this same barrel taken February 5, showed 192 ppm. Material from another barrel, opened March 9, showed 253 ppm at that time and 104 ppm on April 5. The third barrel was opened April 25 and showed 129 ppm at that time.

Analyses were made on two samples of alfalfa leaf meal. One showed 17 ppm on January 24 and a second 62 ppm on February 5. The latter sample was the lot used throughout the feeding trial. These samples of alfalfa leaf meal were not very satisfactory, but were all that could be obtained at that time.

Plan of Feeding Trial. Six pens of 25 Rhode Island Red pullets each were used and the test was run for 20 weeks. The pens receiving the basal ration and the alfalfa leaf meal ration were continued for an additional 12 weeks.

The ration fed each pen was as follows: Pens 1 and 2—basal ration plus second crop ladino silage fed at the rate of 4 pounds per 100 hens daily; Pens 3 and 4—basal ration plus 5 per cent alfalfa leaf meal; and Pens 5 and 6—basal ration.

Results. The following table shows the results of this year's feeding test for a twenty-week period.

Pen No.	Eggs per hen	Gain or loss body weight	Mortality	Per cent hatchability
		ounces		
1 (Silage)	105.6	+1.85	1	91.6
2 (Silage)	108.2	+1.95	1	92.3
3 (Alfalfa)	114.9	+7.95	2	85.2
4 (Alfalfa)	115.5	+4.60	2	83.7
5 (Basal)	104.9	-2.70	2	63.0
6 (Basal)	111.7	+ .90	4	70.5

There was no appreciable difference in egg production among the six pens for the twenty-week period. The birds on the basal ration lost weight in one pen and maintained practically their original weight in the other, while those in all but one of the other pens made appreciable gains. Mortality was slightly higher in the pens receiving the basal ration. The hatchability of the eggs produced by these

birds was considerably higher in the pens fed silage as compared to those from the basal ration pens. These data indicate that ladino silage is a satisfactory substitute for alfalfa leaf meal for egg production where hatchability is a factor.

A COMPARISON OF STRAIGHT RUN, COCKEREL, AND PULLET CHICKS FOR BROILER PRODUCTION. J. Robert Smyth. One preliminary study on broiler production was run during the winter of 1945. The results reported here are not very conclusive and are reported only to show the type of work planned for the future. The purpose of this test was to determine the efficiency of pullet, cockerel and straight run chicks as to feed utilization, rate of growth and quality as broilers.

Three lots of 208 chicks each were used. One lot was straight run as they came from the incubator, one lot was sexed pullets and one lot was sexed cockerels. They were brooded in 12 x 12 brooder houses with coal-burning brooder stoves. The New England Conference chick and broiler mashers were used for all lots and feed was kept before them in hoppers at all times. The chicks were weighed at the start of the test and each week thereafter for twelve weeks.

Results. 1. The cockerels were heavier at twelve weeks, straight run chicks next and pullet chicks lightest.

2. There was practically no difference in the amount of feed consumed for each pound of gain; the cockerels using 4.19 pounds, straight run 4.29, and pullets 4.30 for each pound of gain.

3. There was no difference in mortality.

4. The pullets in both the pullet lot and in the straight run chicks were better feathered than the cockerels at twelve weeks of age.

5. It would seem that pullet chicks can profitably be used as broilers especially if in normal times they would bring a higher price per pound. A poultry buyer stated that in normal times without price ceilings, pullets would bring at least five cents more per pound as broilers than would cockerels.

BREEDING

LENGTH OF INCUBATION PERIOD IN POULTRY AS RELATED TO CHARACTERISTICS OF PROGENIES. J. Robert Smyth. The study of the characteristics of chickens both as chicks and as adults in rela-

tion to the time during the hatch that they emerge from the shell was continued during the year. The work involved two parts: (1) A study of egg production, body weight, age at first egg, and mortality on birds hatched during the winter and spring of 1944, and (2) a study of the sex of the chicks, mortality, rate of growth and rate of feathering of chicks hatched during the winter and spring of 1945. This report will be divided into two parts as indicated.

Part I. Records are being taken on 76 females under trapping and these are being studied for the characters listed above. The classification is based on eight-hour hatching periods although observations were made at two-hour intervals during the hatch.

1944 Females

Group	No. birds	Age 1st egg	Body Wt.	Production*	Mortality
		days	lb.		
1-4 (8 hrs.)	11	176.3	4.84	(4) 198.2	1
5-8 (8-16 hrs.)	20	168.0	4.61	(8) 209.7	0
9-12 (16-24* hrs.)	24	149.7	4.85	(14) 209.1	2
13-16 (24-32 hrs.)	17	173.3	4.88	(7) 205.8	1
17+ (32 hrs. +)	4	218.2	4.50	None	1
				complete	

* Number in parentheses indicates the number of hens that had finished a year's production at the time this report was prepared.

Part II. Six pens were mated using four females of early, medium, and late hatching in each. Two each of these pens were mated with males that were early, medium, and late hatching respectively. Two hatches were made from each of the six pens and three additional hatches from three of the pens. The total number of chicks hatched was 971. Data on 684 chicks, or the first four hatches, are presented below.

Data on Sex

Groups	No. chicks	No. males	% males	No. females	% females
1-4	63	24	38.0	39	61.9
5-8	151	72	47.6	79	52.3
9-12	244	121	49.5	123	50.4
13-16	167	88	52.7	79	47.3
17-19	59	33	55.9	26	44.0

Data on feathering were taken when the chicks were ten days old. The amount of tail feathering was recorded as from 0 to 3. Those having no tail feathers were recorded as 0 and those having well developed tails were recorded as 3. The 1 and 2 would indicate a tail growth someplace between the two extremes. These data are given below.

Data on Feathering

Group	No. chicks	No. 3	% 3	No. 2	% 2	No. 1	% 1	No. 0	% 0
1-4	64	21	33.3	22	34.9	17	27.0	4	6.3
5-8	150	41	27.1	39	25.8	50	33.1	20	13.2
9-12	242	68	27.8	64	26.2	78	31.9	32	13.1
13-16	167	33	19.7	47	28.1	64	38.3	23	13.7
17-19	58	13	22.0	15	25.4	19	32.2	11	18.6

Data on Growth and Mortality

Group	No. chicks	Av. wt. 9 wks.	No. dead 9 wks.	% mortality
		grams		
1-4	63	*914.6	3	4.7
5-8	151	938.6	5	3.3
9-12	244	952.1	18	7.3
13-16	167	964.0	9	5.3
17-19	59	946.3	8	13.5

* 907 grams = 2 pounds.

Conclusions. The first chicks that hatched (1944) with the exception of the extremely early hatching ones, matured at an earlier age than the ones hatching later.

There was practically no difference in egg production, body weight at first egg, and mortality. The data on egg production are limited as only a few birds had completed their year when this report was prepared.

The first chicks that hatch predominate in females, the middle of the hatch are practically equal in the sexes, and the last ones to hatch predominate slightly in males.

Early feathering as indicated by tail feathering at ten days of age was greater in the chicks that hatched during the first eight hours of the hatching period than in those that hatched later.

There was no appreciable difference in body weight at nine weeks of age.

Mortality was higher in the extremely late hatching chicks but there was no appreciable difference in the other groups.

Considerable attention is being given to the possible inheritance of the tendency for chicks to hatch at different periods of incubation. The work so far indicates that this is an inherited characteristic, but the work has not progressed far enough to determine the mode of inheritance.

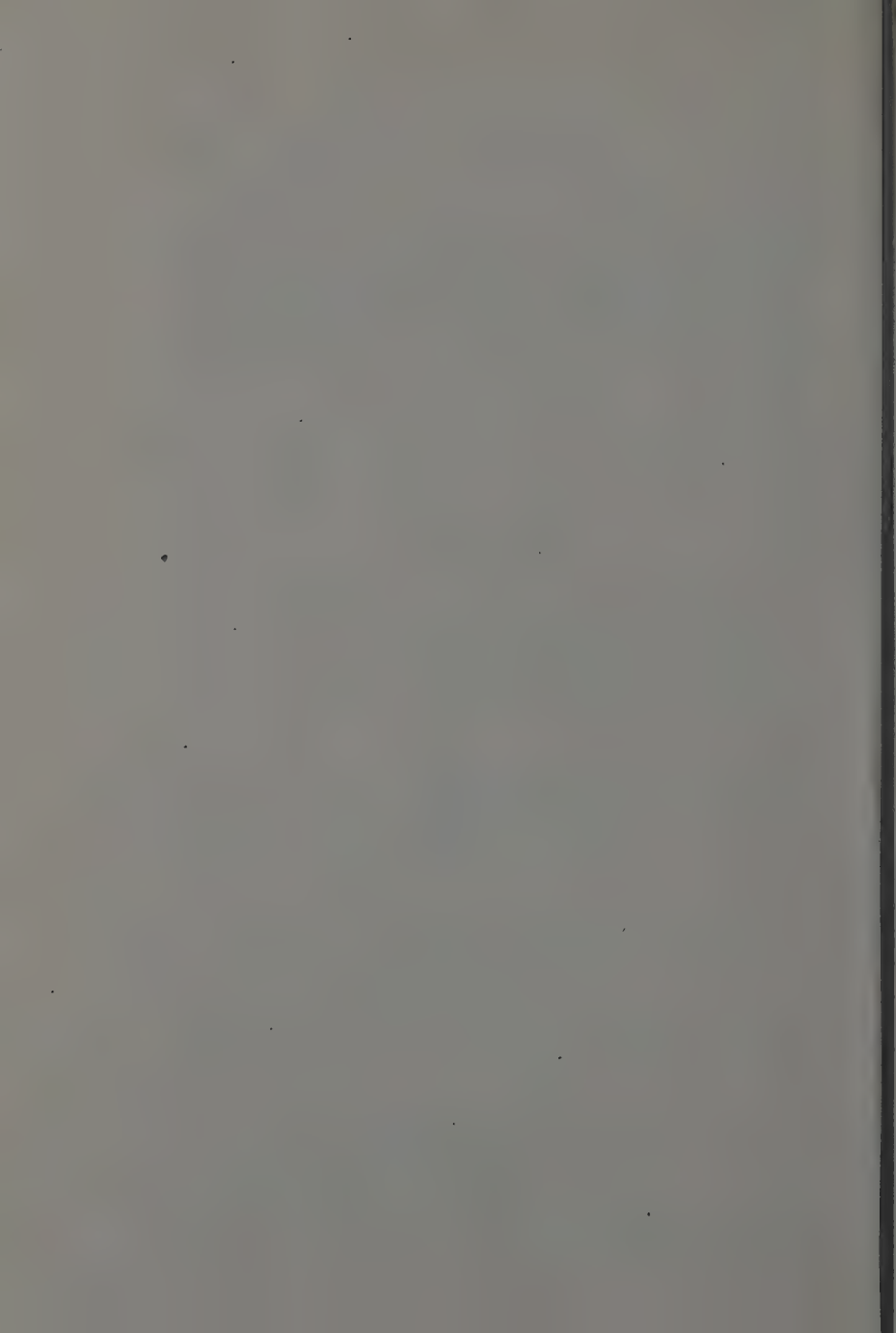
A few families from the 1945 matings have been rather consistent in their behavior and will be used as a basis for further study.

PUBLICATIONS

Further information may be had by those interested by writing to the individuals in charge of the various studies. Publications of the Station are mailed free upon request.

The following list of the more recent publications may be of interest and are available for distribution :

- Bulletin No. 412. Egg Production in Maine.
- Misc. Publ. No. 589. Grain Problems and Feed Conservation Practices of Maine Poultry Producers.
- Misc. Publ. No. 591. Equipment Needs and Use of Poultry Equipment and Buildings on Maine Poultry Farms.
- Misc. Publ. No. 597. Farm Labor on Maine Poultry Farms.



POTATOES

Potato production for seed purposes and for table stock is Maine's most important farming enterprise. The potato industry continues to have problems and the research program is aimed at solutions of the more important of these. The potato was one of the most important food crops during the war period and will continue as highly important through the reconstruction period. This is due to its capacity to produce large quantities of food per acre and to the fact that it is an important item in the diet for most peoples of the world. Maine has stood at the top on its production per acre of table-stock potatoes and on its production of good seed.

POTATO DISEASES AND INSECTS¹

Bacterial ring rot, leafroll including net necrosis, and late blight continue as the three most serious potato diseases in Maine. There are prospects that new varieties or other means will be available for easier control of each of these within a very few years. The combination of table-stock quality with resistance to all three of these diseases, however, requires a tremendous amount of detailed work. Nevertheless, progress is being made and each year brings us closer to success.

BACTERIAL RING ROT. Reiner Bonde, M. R. Harris, Donald Merriam. Until resistant varieties are available, it will be necessary to improve the other measures of control such as seed treatment, sanitary methods, and better seed plots.

Better Seed Program. Data secured from surveys show that progress is being made in combating this disease in certain areas where the farmers have made a special effort to secure disease-free seed while little or no progress is being made in other areas. It is hoped that the proposed "feeder farm" project will be a factor making available more disease-free seed which can be distributed in the communities where it is needed.

¹ A substantial sum from the cent-a-barrel potato tax has been available for the studies on "Potato Diseases and Insects" and for the studies with "Potato Products."

Seed Piece Disinfection for Control of Ring Rot. A disinfectant is needed which will destroy the causal organism of ring rot and not injure the seed potatoes or corrode the metal parts of the machinery and equipment used in the production and marketing of the potato crop.

Puratized N5-X was tested regarding its value as a disinfectant of potato seed pieces for the control of ring rot. Solutions of this material were tested at three concentrations and for five, 30- and 90-minute treatment periods. (See Table 1².) This material was ineffective in reducing the amount of infection at the three concentrations and for the three periods of time under test. Furthermore, it was very toxic to the cut seed potatoes and reduced materially the stand and vigor of the plants.

Disinfectants for Killing the Ring-Rot Organism. A comparison was made of a number of different disinfectants regarding their relative ability to destroy the ring-rot organism on pieces of contaminated burlap sacks. The different bactericides were tested at different concentrations using 5-minute treatment periods. (See Table 2.) Copper sulfate, used at the rate of 1 and 2 pounds in 10 gallons of water, did not completely destroy the organism. It was completely destroyed when two pounds of copper sulfate were added to a saturated table salt solution. Table salt, however, without other disinfecting material was not effective.

Coal tar dip preparations were reasonably effective bactericides at dilutions of one and two gallons in 100 gallons of water, although a trace of infection did survive at a concentration of four gallons of tar dip in 100 gallons. Formaldehyde was not entirely effective at a concentration of one pint in 40 gallons but was effective when used at a concentration of 4 pints in 100 gallons of water. Corrosive sublimate continued to be the most effective disinfectant for destroying the ring-rot bacteria. However, this material is very corrosive to metals and expensive to use in large quantities.

Survival of Ring-Rot Bacteria under Different Storage Conditions. In February of 1943, studies were begun to determine the length of time the ring-rot bacteria can survive on contaminated potato bags when subjected to different storage conditions. Twelve-inch squares of potato burlap bags were severely contaminated with the crude ring-rot material taken from infected potatoes. One

² All Tables are in the Appendix, pages 565-602.

group of contaminated potato bags was hung on the north side of a farm building where it was subjected to the rigorous weather conditions that prevailed during the winter of 1943-1944. Similar pieces of contaminated bags were put into storage chambers maintained at 30, 32, and 36° F. These pieces of bags were removed after different intervals of time and used to inoculate freshly cut potato seed pieces by the seed-piece rubbing method. The seed pieces were planted in the greenhouse and in the field immediately after they had been inoculated. Ring-rot bacteria were not completely destroyed by an exposure for 483 days (approximately 1 year and 4 months) to outside weather conditions as they prevailed in Aroostook County during the winters of 1943 and 1944. (See Table 3.) The bacteria appeared to have been dead at the 36° F. temperature after storage periods of 334 and 485 days in the controlled temperature bins. The results show that the ring-rot bacteria can survive under certain conditions for long periods of time.

The data in Table 4 are from another experiment of a similar nature. Here the contaminated pieces of burlap bags were stored at 32° F. for a period of 11 months and then were used to inoculate the freshly cut potato seed pieces. Two methods were used to inoculate the seed pieces in order to test the viability of the organism. It may be noted that the bacteria survived for the 11-month period on each of the 5 pieces of bags that were tested. The amount of infection that resulted was much higher when the seed pieces were inoculated by the eye-pricking method, the percentage of infection which resulted being from 70 to 100 per cent. The percentage of infection was from 0 per cent to 50 per cent when the seed pieces were inoculated by the seed-piece rubbing method.

Survival of Ring-Rot Organism in the Soil. Previous studies conducted in Maine have indicated that the ring-rot bacteria do not survive for long periods of time in the soil. In 1944, greenhouse soil in which diseased potato plants had grown was stored in barrels in the greenhouse and outside. After a period of six months the soil was put into greenhouse pots and freshly cut potato seed pieces were planted. No ring rot appeared in 400 plants grown in this contaminated soil.

In another experiment, greenhouse soil in which plants having ring rot had been grown was contaminated further with crushed pieces of ring-rot tubers and put into pots and placed outdoors in

a sheltered location. At about three-week intervals a few of these pots were taken to the greenhouse and planted with freshly cut potato seed pieces. Thirty per cent of the plants developed ring rot when the seed pieces were planted immediately in the contaminated soil. Twenty per cent infected plants resulted when the seed pieces were planted three and six weeks after the soil was contaminated. No ring rot developed when the seed pieces were planted in the soil later than six weeks after it had been contaminated. These data support those previously secured to the effect that the ring-rot bacteria do not survive for long periods of time in unsterilized field soil.

Breeding for Resistance to Ring Rot. The tests for ring-rot resistance were continued in 1944. In one experiment eight varieties were compared regarding their relative resistance to the disease when inoculated by artificial methods. This was done to determine whether certain varieties previously selected as being resistant actually are or whether they merely had escaped.

Green Mountains and Katahdins continued to be very susceptible to infection. (See Table 5.) The Sebago variety appeared to be somewhat less susceptible and only 51 per cent of the inoculated seed pieces developed ring rot in contrast to 95 and 72 per cent respectively for the Green Mountain and Katahdin varieties. President and Seedlings 47102, 46952, 870, and 824 continued to show resistance to infection. These varieties are not immune but contract the disease less readily than do the standard varieties now being grown in Maine.

Varieties differ greatly regarding the extent to which the tubers decay as a result of ring-rot infection, those of the Green Mountain, Katahdin, and Sebago decaying very extensively when infected with the disease. The resistant varieties, however, show much less extensive decay, the tubers remaining firm and intact with only a slight amount of decomposition.

Ring-Rot Resistance in Progenies from Crosses with Resistant Varieties. The progenies from a number of crosses, using resistant parents, were tested for resistance to ring rot in the field in 1944. The data secured from these experiments are summarized in Table 6. Resistance to ring rot is inherited and a high percentage of resistant seedlings will result if resistant parents are used in making crosses. Many resistant seedlings result if the President variety and seedlings 46952 and 336-144 are used as parents. Al-

though the President and seedling 336-144 (President x Katahdin) transmit a high percentage of resistance to the progenies, they are not suitable for the production of new varieties that will be desirable for Maine. When these are used as parents (President, 336-144, and other related varieties), a high percentage of very late seedlings with ill-shaped tubers is produced. Seedlings 46952 and 47102 transmit ring-rot resistance and also produce progenies that possess good cooking and marketing qualities. It now seems that it will be possible to produce and select new varieties that are resistant to ring rot and commercially desirable.

Ring-Rot Survey. Prior to 1944, two ring-rot surveys had been made in several localities in the State. In the 1941 survey most of the farms in each area were inspected. Seventy-two per cent of the farms examined in three towns were infected with ring rot. Forty-one per cent of the total acreage was infected. In one town 67 per cent of the farms, 34.5 per cent of the fields, and 40.9 per cent of the total acreage showed a trace or more of ring rot. In 1943, a second survey was made of this town. The ring-rot infestation had been reduced to some extent although it was present on 41 per cent of the farms, 30 per cent of the fields, and 27 per cent of the acreage.

In the 1944 survey, 62 farms selected at random in this same town were visited. Of these, ring rot was found on 19 farms, very largely as a mere trace in the fields. There was a total of 1,513 acres inspected, made up of 80 fields. Two hundred and seventy-eight acres in 19 fields were infected with ring rot. - (See Table 7.) On a basis of infected fields the percentages for the three years were 35.4, 29.7, and 23.7, respectively. On an acreage basis the percentages were 40.9, 27.2, and 17.9 for the three years. These data show that much progress has been made in reducing the amount of ring rot in this town. It now appears in few fields and in these very largely as a trace only.

From time to time growers and others have expressed themselves as believing that one variety or another is especially susceptible to the ring-rot disease. Data for the year 1944 from one town tend to show that there was a wide variation in the percentages of disease in the various varieties. (See Table 8.) Katahdins made up 13.2 per cent of the diseased acreage. This is considerably less than 33.9 per cent which was diseased in 1941, or 32.7 per cent which had ring rot in 1943. By way of contrast, the Houma variety

was free of disease in 1941, rose to 15.6 per cent diseased in 1943, and to 33.3 per cent in 1944, but these data were taken on a relatively small acreage. It will be noted that the Green Mountain variety, like the Katahdin, fell rather sharply in the amount of ring-rot infection from 1941 to 1944. The Irish Cobbler and Sebago varieties were diseased in 1941 but were free of ring rot in 1944. These data suggest that there is little ground for the belief that any one potato variety of those grown at present is more susceptible than others to the ring-rot disease.

Severity of Ring-Rot Infection. The percentage of ring rot found in the fields of one town for the years 1943 and 1944 has been summarized in Table 9. In 1943, 67.5 per cent of the infected acreage was showing only a trace of the ring-rot disease. In 1944, this figure was raised to 74.5 per cent. In 1943, the infected acreage was 27.2 per cent of the total surveyed and in 1944 it was 18.4 per cent of the total acreage surveyed. The disease in 1943 was characterized as severe on only 22 acres out of 2,486 acres examined. In 1944, none of the acreage out of 1,513 acres examined could be classified as being severely infected by the disease.

Seed Sources. It is interesting to note that in one town surveyed the source of the potato seed stock may have been the means of spreading ring rot in that area. Table 10 shows that seed for 4 of the 19 infected fields surveyed came from one seed source which was known to be infected. Two other seed sources each provided seed for two infected fields. These eight fields made up nearly 45 per cent of the infected acreage surveyed in this town. Thus it is clear that a few contaminated seed sources can be the means of spreading the ring-rot disease over extensive areas.

Farm Security Administration Seed Plots. In cooperation with the Federal Farm Security Administration 34 growers having seed plots were interviewed and bin inspections made where possible. Each of these growers purchased a small amount of seed which was free of ring rot and much of it had been certified by the Maine Seed Certification Service. This seed was used to plant a seed plot from which enough seed potatoes would be produced to supply the grower's needs for his commercial crop the following year. Each grower was given instructions by the Farm Security Administration personnel as to the method of handling the certified seed used to plant the seed plot. The planter, digger, tools, barrels, and bins used in growing and storing these seed plot potatoes were to be

either new or sterilized. In addition, the growers were advised to plant and harvest the seed plot before handling any commercial potatoes. The growers followed this advice to some extent as indicated in the data shown in Table 11.

Of the 34 growers who produced their own seed under the Farm Security Administration program, 27 were found to have grown seed believed to be free of ring rot. There were 7 who were known to be unsuccessful in eliminating ring rot from their seed plots. By way of contrast, 27 of these growers had ring rot in their commercial fields and only 7 were entirely free of the disease. (See Table 12.)

From the above data it would appear that the method of securing a small amount of certified seed to be increased on a seed plot offers possibilities of enabling a grower to eliminate ring rot from his farm.

LEAFROLL INCLUDING NET NECROSIS. *Resistant Varieties.*³

HIGHMOOR FARM TESTS. Donald Folsom. Seedlings have been introduced to Highmoor Farm since 1938 in tests for field resistance to leafroll. Survivals on the basis of resistance and of tuber type are given below.

Year of introduction and number of seedlings introduced		Still apparently healthy in 1943 and replanted in 1944	Leafroll in 1944
1938	776	None	—
1939	1422	18	0
1940	1120	6	1
1941	2200	21	19
1942	1273	171	136
1943	1795	1530	834
1944	2022	—	—

Actually, of the 18 introduced in 1939 and remaining in the test in 1943, all but one have shown some leafroll, but the average percentage of leafroll taken per year for the last three years has been 4 per cent while healthy Chippewas and Green Mountains

³ The potato breeding program is cooperative with the Bureau of Plant Industry, Soils, and Agricultural Engineering of the U. S. Department of Agriculture. Grateful acknowledgment is made to Doctor H. A. Jones, Doctor F. J. Stevenson, and Robert Akeley who are the Bureau representatives on this study in Maine.

have taken an average of 85 per cent and 50 per cent per year respectively.

The 1,795 seedlings introduced in 1943 were all with one or both parents from the resistant seedlings surviving from the 1939 introductions. The reduction from the 1,795 to the 1,530 planted in 1944 was due to discarding 265 for poor tuber type in the fall of 1943. Some of the crosses of this group went only about 35 per cent leafroll while others went 75 per cent, with no correlation with order of planting or location in plot in the year of exposure, 1943.

This apparently greater resistance of the seedlings introduced in 1943 was accompanied by greater vigor and better tuber type attributable to their parentage (seedling and commercial varieties). The results indicate that faster progress can now be made in getting new seedlings that are leafroll-resistant and commercially desirable. Most of the resistant seedlings from those introduced in 1939 were from the cross Imperia x Earleine, parent varieties not considered highly desirable commercially. However, the few remaining resistant seedlings of the early introductions are being used as parents in crosses with good commercial varieties and with seedlings that are resistant to other diseases.

Comparison of Leafroll-Resistant Seedlings. Donald Folsom, F. H. Steinmetz. Some of the seedlings that showed field resistance to leafroll at Highmoor Farm were discarded on account of obviously undesirable characteristics such as premature production of sprouts, too many stalks per hill, weak vines, too early maturity, leaf rolling, highly undesirable tuber skin, highly undesirable tuber shape, and too many and therefore too small tubers. Conditions were not suitable at Highmoor Farm for judging yielding capacity. Eighteen seedlings, exposed from 1939 or 1940 to 1943 and still practically free of leafroll, were planted in a series of plots on Aroostook Farm with Green Mountain checks. Seed pieces were cut to 1.5 to 2 ounces each. See Table 13 for data on vines and tubers.

Correlations were tested between certain characteristics including some of those listed in Table 13. (See Table 14.) Among the various seedlings, the more stems there were per hill the more tubers there were per hill, and the larger the number of stems or the more the number of tubers per hill the less the tubers averaged in weight and the greater was the yield per hill. Then, the greater

the yield per hill the more plants there were per plot, and each of these apparently resulted in more yield per acre. The seedlings varied much from inherent causes, some proving undesirable because of too many stems per hill and a consequent excess of small tubers. This fault was absent from X1276-48 and X1276-185; the latter yielded well and the former might have if the seed had been treated for *Rhizoctonia*.

Resistance of Selected Potato Seedlings to the Aphid-Borne Leafroll Virus. Reiner Bonde, Geddes W. Simpson. A number of seedling potatoes were secured in 1944 from the United States Department of Agriculture for testing for resistance to leafroll transmitted by infected individuals of *Myzus persicae* (the peach aphid) transferred manually from leafroll plants to the seedlings. Seedling progenies from seven crosses were included in the test. First-year tubers produced by plants grown from true seed in a greenhouse at Beltsville were planted at Aroostook Farm, May 23, 1944. Specimens of the peach aphid from a greenhouse culture were transferred to young cabbage plants and allowed to increase. Late in June, transfers were made to half-grown leafroll Katahdin plants in 6-inch pots. After a period of at least 10 days had elapsed, the Katahdin plants were transported to the field where leaves, leaflets, or parts of leaflets were detached and placed on the seedling potato plants. The amount of leaf tissue used in each case was determined by the number of aphids present. A minimum of five adult peach aphids was used for inoculating each seedling. In many cases, immature aphids were present also on the transferred leaf tissue.

The first transfer was made on July 8, 1944 and subsequent days. Unfortunately, not all of the plants were through the ground by this date so that only the more advanced plants in each cross could be inoculated at this time. The remaining plants were inoculated at intervals until the work was completed in mid-August. Some of the later inoculations were made by taking naturally infested leaves from leafroll plants growing in the field.

Current season leafroll symptoms became evident in the earliest inoculation within 15 to 25 days of the time the virus was introduced. It was less evident in the later inoculations. The entire planting was examined critically in September for current season symptoms of leafroll. Each plant that did not show

symptoms of leafroll was marked for harvesting and is to be replanted in 1945 to determine the incidence of leafroll in those plants not showing current season symptoms. It is expected that there will be some escapes in this group as the aphids used are, of course, subject to attacks of parasites and predators and it cannot always be proved that the infestation found on a given plant arose from the few aphids transferred earlier. The tubers produced by many of the plants showing current season leafroll were saved and will be stored under conditions favoring the development of net necrosis and will be examined for this condition.

The results of the season's work are presented in Table 15. It should be emphasized that the tubers saved for further testing do not necessarily represent resistant sorts. They may be escapes, they may have leafroll but have failed to show current season symptoms, or they may actually be resistant to leafroll.

Effect of Fertilizer on Net Necrosis Development. PERMANENT PLOTS. Joseph A. Chucka, Arthur Hawkins. Tuber samples taken from the permanent plots in 1944 and examined for the development of net necrosis showed about the same effects from fertilizer treatments as were observed in previous years. The net necrosis readings were somewhat higher in 1944 than in previous years and were not as closely associated with fertilizer treatments as was stem-end browning. (See Table 16.)

FERTILIZER TESTS ON NEW LAND. Many of the fertilizer treatments on the permanent plots have been repeated on the same land for as many as 18 years. Thus the data on net necrosis obtained from these plots should be the result of the residual effect of fertilizer treatments in so far as fertilizers are a factor. To measure the more immediate effect of certain treatments on the development of net necrosis, an experiment was laid out on a piece of land on Aroostook Farm which had not been previously fertilized. The fertilizer treatments used included several rates of application (none, 2500, and 3500 pounds per acre). They included fertilizer without potash and with potash from three different sources and they included treatments with and without added chlorine, boron, and copper. The effect of these treatments on potato yields and on the development of stem-end browning and net necrosis is shown in Table 17. None of the treatments used produced potatoes that were free from net necrosis. In fact the percentages of net necrosis developed in the tubers grown

on this new land were nearly as high as those obtained from the permanent plots.

BORON IN POTATO FERTILIZERS. Several levels of boron in the form of borax, spent boron catalyst, and boron silicate glass were added to potato fertilizers to study their effect on the development of net necrosis. These materials apparently had little or no effect on net necrosis. They offer no possibility as a corrective measure because they are extremely toxic to the potato plants. Their use resulted in yield reductions all the way from 14 to 73 barrels per acre. (See Tables 18 and 19.)

Effect of Planting Date on Net Necrosis. A. Frank Ross. Two strains of Green Mountains were planted at three different dates at Aroostook Farm. Samples were dug from each planting at three different dates, stored at 50° F. and examined for net necrosis 100 or more days after digging. The results are shown in Table 20. In all cases those planted on May 15 were comparatively low in net necrosis, those planted June 1 were considerably higher and except for the late dug samples, those planted June 15 were still higher. Since the tubers were stored at a temperature optimum for the development of net necrosis, the figures represent the maximum to be expected. In farm or commercial storage they might be uniformly lower in net necrosis, depending upon how soon after digging the storage temperature dropped to below 50° F.

The data from 13 other plots are summarized from the standpoint of date of planting. (See Table 21.) All other factors, such as treatment, location, digging date, seed, etc., were ignored and all plots classified in regard to planting date. Here again, early planting resulted in considerably less net necrosis. Hence, in 1944, the date of planting was one of the most important factors affecting the amount of net necrosis in the crop. This is in agreement with earlier experience that there is usually less spread of leafroll in early planted potatoes.

These data suggest that early planting of Green Mountains may go far in helping to control net necrosis. It is recommended, therefore, that growers of Green Mountains plant this variety first, that is, before other varieties are planted. This is true for both seed growers and table-stock growers. The data also suggest that one reason why net necrosis has been more troublesome in

recent years is that, due to an expanded acreage program, planting is often continued well into June.

Effect of Digging Date on Net Necrosis. A. Frank Ross. Some information was obtained in respect to the effect of date of digging on net necrosis in 1944. (See Tables 20 and 25.) In general, the amount of net necrosis increased with later digging dates up to about October 1, but after that date there appeared to be a decrease in the amount of net necrosis obtained.

Selection for Resistance to Net Necrosis. A. Frank Ross. All Green Mountain tuber lines so far investigated are equally susceptible to net necrosis. There was no correlation between the behavior of a tuber line the past two years and the amount of net necrosis developed in 1944. On two plots (Tables 20 and 26), the Keswick strain developed more net necrosis than the Minnesota lot. The difference was more pronounced when the tubers were dug early. The data are insufficient to conclude that the former is more susceptible to net necrosis. Small differences in the amount of leafroll in the seed might account for the differences. On other plots the two strains produced the same amount of net necrosis.

Effect of Minor Elements on Net Necrosis. A. Frank Ross, Arthur Hawkins (U.S.D.A.), Joseph A. Chucka. Work was continued on the effect of minor elements, added to fertilizer or applied as a spray, on the development of net necrosis. This year bromine, chromium, strontium, cobalt, vanadium, yttrium, lanthanum, cerium, neodymium, thorium, uranium, rubidium, and cesium were tested. All were without any appreciable effect on net necrosis development. Results from the 1943 season with chromium salts could not be substantiated. In addition, two commercial products, Es-Min-El and Milorganite, both reported to contain several minor elements, were without effect on net necrosis. (See Tables 28 and 29.)

Fertilizer and Spread of Leafroll. A. Frank Ross, Joseph A. Chucka. Samples from the permanent plots were again planted for leafroll readings. (See Table 23.) Results in general agree with those of previous years. Increased amounts of fertilizer resulted in an increase in the spread of leafroll virus, increased net necrosis, and increased the net necrosis:leafroll ratio. This seems to be due chiefly to the amount of phosphorus applied, because a direct correlation was also obtained between the amount of phosphorus applied and the spread of leafroll, the amount of net necrosis and the net necrosis:leafroll ratio. In the nitrogen

series, the greatest amount of net necrosis and the greatest spread of leafroll were obtained when from 40 to 80 pounds of P_2O_5 per acre were applied. The net necrosis:leafroll ratio decreased with increasing amounts of nitrogen. In the potassium series, the greatest spread of leafroll resulted from the application of 40 pounds of K_2O per acre. Larger amounts decreased both the spread of leafroll and the amount of net necrosis. The net necrosis:leafroll ratio was not affected by the higher amounts of K_2O . The C.P. plots were slightly lower on all three counts than for corresponding applications of commercial fertilizer. Substitution of the sulfate for the chloride as the potash carrier reduced the amount of net necrosis, the spread of leafroll and the net necrosis:leafroll ratio. The data from the permanent plots for three years indicate that the continued application of large amounts of P_2O_5 favors the spread of leafroll and likewise increases the net necrosis:leafroll ratio. The presence of high amounts of chloride in the fertilizer also tends to increase these two factors.

APHIDS AFFECTING POTATOES IN MAINE.⁴ Geddes W. Simpson, Wayland A. Shands. *Wild and Cultivated Host Plants as Sources of Aphid Infestation in Potatoes.* SECONDARY HOSTS. *Biennial weeds as overwintering hosts of wingless aphids.* Observations made at frequent intervals during the early part of the season, failed to disclose overwintering of the summer forms of aphids on any of several species of biennial weeds. The observations were made before the winged forms of those species of aphids affecting potatoes⁵ had matured on their primary hosts.

Importance of Weeds as Aphid Hosts. Further studies in 1944 were made to determine the importance of seven species of weeds⁶ as hosts of several species of aphids.

⁴ The studies with aphids affecting potatoes and their control are made in cooperation with the Bureau of Entomology and Plant Quarantine of the Agricultural Research Administration of the U. S. Department of Agriculture. W. A. Shands and T. E. Bronson are the Bureau representatives working on these problems in Maine.

⁵ The buckthorn aphid, *Aphis abbreviata* Patch; the green peach aphid, *Myzus persicae* (Sulz.); the potato aphid, *Macrosiphum solanifolii* (Ashm.); and the foxglove aphid, *Myzus pseudosolani* (Theob.).

⁶ Wild radish, *Raphanus raphanistrum* L.; wild rutabaga, *Brassica campestris* L.; smartweed, *Polygonum lapathifolium* L.; hemp nettle, *Galeopsis tetrahit* L.; lamb's-quarters, *Chenopodium album* L.; field sorrel, *Rumex acetosella* L.; and ox-eye daisy, *Chrysanthemum leucanthemum* L. Locally, wild radish is known as kale and wild rutabaga as mustard.

The relative importance of five species of weeds in both 1943 and 1944 is shown in Table 30. Two other weeds, field sorrel and ox-eye daisy, were of no importance either year, although in 1942 they were important hosts of the buckthorn aphid.

In a large measure the results for the two years agree rather closely. The differences shown may have been influenced by several factors. The weeds were colonized by aphids earlier in 1944 than in 1943. The 1944 season in general was much more favorable for rapid, continued reproduction of the aphids since it was somewhat drier during most of the season. Fungus diseases did not kill the aphids until later than in 1943. In general, the initial aphid populations on the weeds in 1944 consisted largely of the green peach aphid and the potato aphid, while in 1943 the potato aphid and the buckthorn aphid were the first to appear. Finally, two species of weeds (wild rutabaga and lamb's-quarters) were not so abundant in the stands of some age groups in 1944 as they were in 1943, and were therefore not available for sampling throughout their entire productive lives; consequently Table 30 shows the relative importance of each weed only as it relates to a stand of weeds having the particular compositions encountered.

Results of these studies indicate rather clearly that the weeds may serve as important hosts intermediate between the overwintering hosts and potatoes, particularly for the green peach aphid. This has been suspected since 1942, but it was not until 1944 that an opportunity was afforded to obtain field data of a clear-cut nature upon the subject.

Relative Importance of Weed Hosts Growing in Competition with Agricultural Crops. Aphid-population counts were made about once a week from late in June until early in August on several species of weeds occurring in agricultural crops to ascertain the importance of these weeds as host plants when growing in different environments. The study involved wild radish, wild rutabaga, wild turnip, smartweed, hemp nettle, and lamb's-quarters when growing in fields of potatoes, oats, crimson clover, mammoth clover, and English peas. As in previous studies in 1942 and 1943, it was found that the weeds were more important as aphid hosts (from the standpoint of total aphid production) when growing in fields of potatoes and annual clovers than when in fields of oats and English peas. Weeds growing in oats, however, as well as in potatoes and annual clovers may be of outstanding importance as

intermediate hosts of the aphids. Wild rutabaga appeared to function as an intermediate host in the potatoes and the oats, and wild radish in crimson clover and mammoth clover.

Potato as a Host of Aphids. Flight studies indicated that weeds and potatoes that had appeared above ground could have been infested by aphids as early as June 7 in 1944; however, practically no potatoes had emerged by then. June 28 was the date when the first aphids were actually observed on potatoes. This is slightly later than in 1942 and 1943, partly because potatoes were later in emerging in 1944. Winged aphids maturing on early potatoes were first found July 27; on weeds growing in potatoes on June 28, in mammoth clover and crimson clover on June 30; in oats on July 3; and in wasteland on July 12. Inasmuch as the potatoes were late in emerging and held only small populations of aphids until well into the summer, there is little question that their initial populations were winged aphids, particularly so in the case of the green peach aphid which developed on weeds.

Aphid-population trends were followed rather closely in four fields of potatoes near Presque Isle by making weekly counts during much of the season. A general comparison of the data with those obtained during 1942 and 1943 indicates that the relative abundance of the several species of aphids varied markedly from year to year and between fields during any one of the years, and that there were also differences from year to year in the first date on which 100 per cent of the plants were found to be infested, and in the overall intensity of the infestation.

In general, the buckthorn aphid was most abundant in 1942, followed by the green peach aphid and the potato aphid; in 1943 the potato aphid was more abundant and the green peach aphid was almost absent, and the buckthorn aphid was abundant in some fields but practically absent in others; and in 1944 the green peach aphid was by far the most abundant in most fields, followed by the potato aphid. The 1944 population trend for the buckthorn aphid resembled that indicated for 1943. Including the buckthorn aphid, the heaviest infestation of aphids was in 1942, followed by 1944 and 1943, but when that species was excluded the rank was 1944, 1942, 1943. The approximate dates when all potato plants were found to be infested by aphids were July 15, 1942, August 15, 1943, and July 30, 1944. The composition of the aphid population varied largely from field to field each year.

Population counts of aphids infesting several varieties of potatoes, planted in small plots in one field, were begun in an effort to determine whether varietal differences exist in respect to suitability as hosts for the several species of aphids under field-growing conditions. The study had to be discontinued in mid-August when heavy infestations developed, but indications of value were obtained. The varieties Irish Cobbler and Green Mountain were considerably more productive of the buckthorn aphid than were the others. Chippewa, Irish Cobbler, Katahdin, and Sebago were much more productive of the green peach aphid than were Green Mountain or Mohawk. There was little varietal difference in respect to the potato aphid, although the largest numbers were found on Irish Cobbler, and the smallest on Chippewa. Infestations of the foxglove aphid were too low to indicate any varietal differences.

Effects on Potatoes of Different Aphid Populations and of Different Percentages of the Seed Pieces Planted Having Leaf-roll. Different aphid populations were maintained on replicated small plots of potatoes growing in one field, as shown in Tables 31 and 32. Three levels were maintained and an added factor of leafroll disease was included to test the effect of disease level upon disease spread. The variety planted in all plots was Katahdin.

Fairly good success was obtained in maintaining the desired populations of the green peach aphid and the potato aphid, particularly the former, inasmuch as it was the more abundant. Relatively few specimens of the buckthorn and foxglove aphids were present. The general appearance of the plants, the prevalence of honeydew on the plants, and of discolored veins, and the order in which the plants died in the fall seemed to be closely and positively correlated with the level of aphid population. From the standpoint of U. S. No. 1 tubers produced, the low-level plots (fewest aphids) yielded 41.3 per cent more than the high-level plots, and the intermediate-level plots 13 per cent more. Both increases were highly significant. The tuber samples taken for readings as to current spread of leafroll are in storage and will be planted in 1945.

Flight Habits and Environmental Factors Influencing Aphid Spread. A seasonal record of aphid flight was obtained for the third consecutive year in several locations near Presque Isle. The average number of aphids per trap taken in 1944 was between that

in 1942 (higher) and 1943 (lower). In 1942 the catch consisted chiefly of the buckthorn aphid, while in 1944 the green peach aphid was more abundant. The flight season of 1944 ended earlier than in the two previous years, owing to a severe outbreak of fungus diseases which about September 8 to 12 attacked the aphids infesting potatoes.

Natural Agencies of Aphids. PARASITES AND PREDATORS. Records made while determining aphid populations on weeds growing in wasteland showed that parasitized aphids first were present in appreciable numbers about August 5-8 and that they were most numerous about August 15-21. On the last date as high as 35 per cent of the aphids found on one species of weed were parasitized. Although fungus diseases had severely reduced the aphid populations on weeds by September 5-8, at that time on one species of weed approximately 90 per cent of those aphids which had not been killed by fungi were parasitized. As might be expected, the parasites did not become abundant before large aphid populations were on the weeds and potatoes, or after large numbers of alatae had matured on the weeds and flown to potatoes.

DISEASES. Fungus diseases (principally *Empusa aphidis*), while late in getting started, virtually eliminated the aphid population on all summer hosts by mid-September. Although the action of fungi on aphids infesting potatoes near Presque Isle first began to appear about September 8, they had been attacking aphids infesting weeds of a certain age since early in August. The weeds on which aphids were first affected germinated after the last hilling operation in potatoes. The aphids on those germinating after the second or next to the last hilling were not affected by the fungi until about August 20. By early September, before the fungi began to attack aphids infesting potatoes, the aphid population on weeds had been reduced by disease and parasites to a very low level.

The action of fungi on the aphids in 1944 may have a very marked effect upon the early-season aphid infestation in 1945. Ordinarily the fungus diseases reduce aphid populations on summer hosts about mid-August, leaving aphid populations ample time to recover. In 1944, however, few of the aphids on potatoes at that time of the season were affected until about September 8, and since the diseases nearly eliminated the aphids on summer hosts, there was little chance for the production of male winged forms

that could move to the primary hosts for fertilizing the progeny of such females as had flown there before September 8. The green peach aphid began its fall migration about August 28. Male winged forms of this species began to mature about August 29. It appears likely that few of the fall females developing on wild plum were mature before the production and flight of males was virtually eliminated. The fall egg count on wild plum was much lower than in the previous two years.

WEATHER. Weather was an important factor influencing the abundance of the aphids and their damage to potatoes in 1944, both directly and indirectly. High temperatures in late April and early May favored an early hatching of eggs, and temperatures during late May and early June permitted a fairly rapid development of the aphids on primary hosts. However, the weather was not very favorable for the spring migrations of the green peach and potato aphids, especially during the peak of their emergence. The number of the spring migrants was considerably smaller than was indicated by the abundance of curled leaves on wild plums where they had developed.

Winter Carry-Over Hosts of the Aphids and Their Relative Abundance. **THE BUCKTHORN APHID.** Recently hatched eggs and young nymphs of the buckthorn aphid were observed near Presque Isle on May 5, and on May 11 young nymphs of this aphid were present inside the unfolding buds. The fall migration began about August 18, and on September 6 approximately 5 to 6 eggs per 100 buds were found on buckthorn near Presque Isle. Examination of fall migrants taken in aphid traps disclosed the presence of male winged forms by August 16.

THE GREEN PEACH APHID. Aphid eggs surviving the winter on wild plum were far more numerous in the spring of 1944 than in 1943. The first nymphs of the green peach aphid were found May 3 and 4 on plums growing out of doors. Practically all aphid eggs on wild plum near Presque Isle had hatched by May 9.

The first mature winged forms of this aphid on wild plum near Presque Isle were observed on May 31, but maturation of the spring migrants reached a peak between June 11 and 26 and ended about July 2. The dates were between two and three weeks earlier than in 1943.

The fall migration began about August 28, a few days later than in the previous three years. Relatively few eggs were de-

posited on wild plums despite the fact that the largest fall populations yet seen on this plant were present. Aphid eggs were first observed on wild plum near Presque Isle on October 4.

THE POTATO APHID. Young nymphs were first observed on wild rose near Benedicta on May 1, and near Presque Isle on May 5. The first mature stem mother at Presque Isle was collected on May 12 on rose. A similar collection was made at this place on May 12 in 1942 and on May 25 in 1943. The spring migratory forms matured largely between June 1 and July 7, with the peak of maturation about June 20 to 23. The period of maturation in 1943 was June 19 to 30.

THE FOXGLOVE APHID. Winged and young wingless forms of the foxglove aphid were observed on June 28. The insect was rather generally present over north-central and central Aroostook, in the vicinities of Lee and Prentiss, and northwest of Bangor. The aphid was absent in northern Aroostook and in the western part of the central Maine potato area, and practically absent in southern Aroostook.

ABUNDANCE OF APHID EGGS ON OVERWINTERING HOSTS. Aphid eggs were much more numerous on wild plum and buckthorn in the spring of 1944 than in 1943, but perhaps somewhat less numerous on wild roses. Eggs were far less abundant on the parts of the wild plum and rose plants, from which samples were drawn, in the fall of 1944 than at the same time in 1943, and considerably less abundant on buckthorn.

WILD CHERRIES A PRIMARY HOST OF GREEN PEACH APHID. Observations during the fall over a period of years at Presque Isle have shown that moderate to heavy populations of the green peach aphid are found on two species of wild cherries commonly occurring in northeastern Maine, *Prunus virginiana* and *P. pennsylvanica*. Colonies of this aphid were never found on them in the spring. It is known that wild cherries serve as a primary host of the aphid in some parts of the United States.

Insecticidal Control of Aphids. Theo E. Bronson. Investigations on the control of the four species of aphids infesting potatoes in Aroostook County were commenced in 1940 and have been carried out each year since 1940. The potato-growing season of 1944 was relatively dry. In 1944 aphid populations on potatoes were low until late in July. (See Table 33.) By early August high

populations were present in most of the fields. The green peach aphid was the predominant species in 1944.

Aphid Control on Seed Potatoes. An experiment was conducted in four fields in which potatoes were grown for seed. Isolated fields were chosen to reduce the possibility of infection from disease-carrying migrants.

Part of each field was treated with a mixture containing ground derris root and part left untreated as a check. When suitable development had occurred, the vines in part of each field were either pulled or killed by spraying. Tubers from vines so treated were harvested earlier than tubers from vines which had not been destroyed.

At three farms ground derris root was employed in a dust mixture and at the fourth farm in a spray. From three to four applications of the insecticide, combined with a fungicide, were made.

The aphid population in all four fields was small until after the third application of insecticides. By this time it had markedly increased and the degree of aphid control obtained with the fourth application was much higher than that obtained previously. The yield of seed potatoes varied greatly from farm to farm. On all farms the treated potatoes outyielded the checks 13 to 24 per cent. (See Table 34.) This increase in yield is much more important where seed potatoes are concerned than it would be with table stock.

Sample tubers taken from early- and late-harvest plots at the four farms were planted in Florida, and the amount of leafroll appearing in new-generation foliage was determined. In all instances a greater amount of leafroll appeared in early-harvest potatoes from plots in which the vines were killed than from those in which the vines were pulled. On an average there was much more leafroll in the potatoes from treated plots than in those from the checks. (See Table 35.)

Insecticide Tests on Small Plots. In a comparison of insecticides, two strengths of DDT (10 and 3 per cent) and 0.75 per cent of rotenone were applied five times to small plots with a hand duster, each treatment being replicated six times. Although all of the mixtures applied were slow in killing the aphids, especially the potato aphid, all treated plots differed markedly in appearance from the checks—a difference much greater than was reflected in the moderate degree of control as determined from a single count.

Analysis disclosed that the tuber yield of plots treated with the mixture containing 10 per cent DDT was significantly higher than that of the plots receiving the other two treatments. (See Table 36.)

Methods of Eradicating Aphid Host Plants. George P. Steinbauer, Ferdinand H. Steinmetz. The principal overwintering aphid host plants are the wild plum, *Prunus nigra* Ait., dwarf buckthorn, *Rhamnus alnifolia* L'Her., and species of wild rose. The more important herbaceous weeds that serve as intermediate hosts between the winter host plants and the potato plants are wild radish, *Raphanus Raphanistrum* L., wild rutabaga, *Brassica campestris* L., and hemp nettle, *Galeopsis tetrahit* L.

Experiments started in 1943 to compare methods of eradicating these host plants were continued in 1944. The wild plum, dwarf buckthorn, and wild rose were eliminated by use of herbicide sprays such as ammonium sulfamate. The soil beneath these treated plants was surface-sterilized with borax or granular sodium chlorate to prevent seedlings from germinating from the fruits which were not affected by the herbicide sprays. If surface sterilization is not practiced then the herbicide spray should be used in succeeding seasons as long as sprouts or seedlings reappear. Large specimens of wild plum can be killed by inserting certain chemicals such as blue vitriol, sodium arsenite, ammonium sulfamate and ammonium thiocyanate into holes drilled into the trunks.

Greenhouse and field experiments indicate that annual weeds can be eradicated from grain fields by use of selective weed killers such as copper sulfate, cyanamid dust and Sinox. Time of application of the sprays was especially important in determining effectiveness of the treatments. The sprays were most effective when applied while the weeds were small, preferably in the 3 to 6 leaf stage. The effectiveness of the Sinox spray was less dependent upon weather conditions and size of weeds than was the case with the other two herbicides. Clover seeded with grain was severely damaged by the weed killers, especially by Sinox. Some preliminary experiments indicate that it may be feasible to plant the clover after the herbicide has been used, either through use of broadcast seeding or use of a machine seeder. While the grain plants appear injured, their recovery is rapid, especially if the application is made while they are small. Where weed infestations are heavy the elimination

of weeds may lead to sufficient increase in yield of grain to more than cover the cost of chemicals.

Because of the ability of weed seeds to remain ungerminated in the soil for several seasons, the use of herbicides for a single season will not prevent the weeds from reappearing the following year. However, their use may be considered an effective part of the weed control program, particularly where the weeds are difficult to remove, as in grain, and where infestations are heavy.

Herbicides for Killing Potato Vines. George P. Steinbauer. Although maximum yields of potatoes are obtained when the vines are allowed to mature, there are certain conditions under which it may be advantageous to terminate growth by removing or killing the vines. This may be desirable for early harvesting either to prevent leafroll infection or to control the size of tubers and as a frost substitute in late harvest.

A wide variety of organic and inorganic chemical sprays and dusts were studied in 1943 and 1944 with respect to their suitability for vine killing, along with a study of methods of applying them. Results of these experiments may be summarized as follows:

1. **HERBICIDES VARY IN RATE OF VINE KILLING.** Dilute sulfuric acid, 5-10 per cent in strength, is the most rapid killing agent yet studied. This chemical is used extensively in Great Britain for "burning off" potato vines for blight control or improving quality of seed. Its use in this country awaits perfection of spray machinery which will resist its corrosive action. Because of its tendency to burn clothing, particularly cotton, and flesh, it can be safely handled only by experienced workmen. Sinox (2 gallons of concentrate to 100 gallons of water, to which is added 10 pounds of previously dissolved sulfate of ammonia) and Dowspray "66" (12 pounds to 100 gallons of water, to which is added 1 pound of previously dissolved sulfate of ammonia) are fairly satisfactory from the standpoint of rate of killing. More rapid killing would be desirable for early harvesting. Other herbicides such as copper sulfate are too variable to be depended upon. Dusts as a group have not proven as satisfactory under Maine conditions as sprays.

2. **RATE OF VINE KILLING VARIES WITH WEATHER CONDITIONS AND VARIETY.** Certain varieties, such as the Sebago, are more difficult to kill than others. Plants making rapid growth, when there is an abundance of soil moisture and moderately high

temperatures, are more readily killed than when they are toughened by low soil moisture or low temperature.

3. COMPLETE COVERAGE OF FOLIAGE WITH HERBICIDE SPRAYS ESSENTIAL. Since the vine killing herbicides are essentially of the contact type, killing will occur primarily on those parts of the plant covered with spray. *A surprisingly large proportion of the spray rigs do not produce complete spray coverage late in the season.* Two nozzles per row and three nozzles per row spray booms were designed to cover plants in rows and early in the season they usually produce good spray coverage. However, late in the season vines may form a continuous mass of foliage from one row to another and some are not covered. None of the vine killers in use will kill foliage that is not covered with spray. Spray rigs with three nozzles per row can usually be adjusted so as to give satisfactory coverage with vine killing agents. Two nozzles per row booms are more difficult to work with. A uniform height boom, with nozzles equipped with fan disks and spaced about 13 inches apart, such as used for applying herbicides in control of weeds in grain fields is better than most two and three nozzles per row booms now in use.

4. HERBICIDE ABSORPTION BY TUBERS IS A FACTOR TO CONSIDER. Sulfuric acid, Sinox, Dowspray "66," and in fact most of the herbicides used for vine killing are of the contact type and are thought to kill only the tissues actually covered with spray. However, a few growers reported that in some 1944 applications of Sinox there was evidence of Sinox injury to tubers. Such tubers showed yellowish discoloration of the xylem vessels, which was of non-bacterial origin. Greenhouse tests indicate that it does not impair the planting behavior and because of the relatively non-toxic nature of the chemical, the small quantity involved would not constitute a health hazard. Of course any discoloration in a tuber is objectionable. Such herbicide discolorations are quite unusual and in some cases at least may be attributed to poor coverage along with low soil moisture. Partially killed plants with deficient soil moisture might linger on for some time before dying and absorb spray or other material applied to the leaves. It is doubtful if these herbicide transfers are likely to be frequent enough to interfere with use of vine killers. However, they are a reason why highly poisonous herbicides such as sodium arsenite killers are not to be recom-

mended for vine killing, unless the tubers are definitely to be used for seed purposes only.

5. VINE KILLING IS EFFECTIVE IN EARLY HARVEST. Florida tests for leafroll and other virus diseases indicate that killing the vines with chemicals can be almost as effective as hand pulling for early harvest if the vines have been thoroughly treated with effective herbicides. Applications of herbicides with sprayers not adjusted to give good coverage cannot be considered equal to hand pulling. *When early harvesting is done with use of vine killers it is particularly important that the operation be done early.* Comparable disease readings of tubers from hand pulled and chemically killed plants were obtained in the Florida tests only when the vines had been treated early. The longer chemical vine killing was delayed, the less effective the method was as compared to hand pulling. Some vines may have virus infection in them and yet tubers may be obtained free from virus if these vines are completely removed by pulling. With chemical killing there is still time for the virus in the stems to travel to the tubers. Sprays such as sulfuric acid which produce almost instantaneous killing of the vines ought to be more effective than those requiring several days for the vines to die.

6. TIMING VINE KILLING FOR EARLY HARVEST. The producer of seed potatoes is confronted with a difficult decision at time of early harvest. The longer it can be delayed the greater will be the yield. However, if the grower hesitates too long he runs the risk of having a higher percentage of diseased tubers. With very rapid killers such as sulfuric acid the vine killing should be done at the same time as hand pulling would have been done. Preliminary data indicate that some tuber growth may take place after vines are sprayed with some of the slower acting vine killers such as Sinox and Dowspray "66." If these data are further substantiated, it would mean that the date of chemical vine killing with such sprays might well be advanced a few days ahead of the time for hand pulling, allowing the same yield, but giving a safety period to take care of the interval required for killing.

Florida Test 1944-45. Wesley F. Porter, Donald Merriam, M. R. Harris, Joel Daigle, Stan Lightbody, Geddes W. Simpson, E. L. Newdick. During the winter of 1944-45 the Maine Agricultural Experiment Station, in cooperation with the Maine Department of Agriculture, again conducted a Florida Test in the vicinity of Aladdin City, Florida.

Both the number of samples entered in the test in 1944 and the acreage the samples represented were the largest since the test was started in 1937. The increase of 419 samples over the number of samples entered in 1943 was due to the larger acreage passing certification in 1944, the increase of 100 acres entered in the Foundation Program, and the increase in the number of acres of the Chippewa variety that passed field inspection in 1944. According to the rules and regulations made by the Seed Certification Service, all fields of the Chippewa variety passing field inspection must be tested in Florida.

Three hundred ten different growers entered a total of 1,085 samples in the 1944-45 test. One hundred eight of the samples entered were taken from the seed plots entered in the 1944 Foundation Program. Sixty-one samples were taken from experimental plots. Nine hundred sixteen samples were taken from tuber unit fields or from fields that were certified in 1944.

Weather conditions were unusually favorable for normal and rapid plant growth. As a result it was possible to complete readings on all varieties entered in the test earlier than in any previous year. Final readings were made on the Chippewa and Sebago varieties by January 11. The readings were completed for other varieties by January 20. In general the leafroll virus was found in higher percentages than any of the other common virus diseases. Ring rot was found in one sample.

A summary of the number of lots of seed by variety and acreage entered in the 1941-1942-1943-1944 Florida Tests and the number of lots and acreage of each variety recommended for table stock or for certified seed are given in Tables 37, 38, and 39.

In 1944 only 22 per cent of the total acreage entered in the test did not exceed the disease tolerance of 2 per cent total virus. Thirty per cent of the total acreage did not exceed 10 per cent leafroll. Forty-eight per cent of the total acreage was not recommended for use as certified seed or table stock seed. These results reflect the greatly increased aphid populations found on potatoes in 1944 as compared with the more favorable conditions of 1943. They also show how valuable the Florida Test can be in preventing the use of badly diseased potatoes for seed.

STEM-END BROWNING. *Transmission of Susceptibility to Stem-End Browning.* A. Frank Ross. In 1943, plugs from tubers of a Green Mountain strain susceptible to stem-end browning were

grafted into seed pieces of a resistant strain. On plot #1 (Table 27) about 50 per cent of the grafted units showed an increase in susceptibility over their corresponding controls. The progeny of these grafted units and their controls were replanted in 1944. The progeny of the grafted units were still much more susceptible to stem-end browning than the parent material. Furthermore, they produced almost as much stem-end browning as the susceptible strain from which the plugs were taken. Plot 2 was essentially the same except that all units were replanted. In both 1943 and 1944 the grafted units were intermediate in susceptibility, indicating that transmission of susceptibility occurred in some of the units. There was no indication of transmission by leaf inoculation.

In 1944, tubers of a resistant strain were planted in the field. Later in the summer, a susceptible strain was used for inarch grafting, i.e., a stalk from a susceptible strain was grafted to a stalk of the resistant strain. Those units where actual union occurred, together with their corresponding controls, were dug and the tubers stored at 50° F. The ungrafted controls averaged 9.4 per cent stem-end browning and the grafted units 34.1 per cent. Seventy-three per cent of the grafted units showed an increase over their corresponding controls. All stem-end browning readings were made after storage for 100 days or longer at 50° F.

The data in this section are interpreted as evidence that a virus is concerned in susceptibility to stem-end browning. Apparently one difference between the resistant and susceptible strains is that the latter contain a virus not present in the former. Evidence at hand indicates that under natural conditions, this unknown virus spreads very slowly or not at all in Maine. In either case, the recommendation that susceptible strains be eliminated is still valid.

Source of Seed and Stem-End Browning. A. Frank Ross. Several lots of foundation Green Mountains were tested for susceptibility to stem-end browning. The results are presented in Table 23. The lots are listed according to strains, as far as is known. The term strain is used in its popular sense, not according to its scientific definition. It may be noted that several lots that have been grown in Maine for many years were fully as low in respect to stem-end browning as the Minnesota lot, which has been used the past three or four years as a typically low stem-end browning lot. In fact, it seems probable that the Keswick strain may be the only one that is highly susceptible. It would be very desirable

for anyone who has the Keswick strain, or who has an unknown strain that gives trouble from stem-end browning, to change to the Highmoor, Vermont, or Phillips strain. While these strains are not immune and may under some conditions give considerable stem-end browning, they will in general produce less than one-third as much stem-end browning as the Keswick when grown under the same conditions.

Tuber Lines. A. Frank Ross. Tuber lines of any given strain all behaved the same with respect to stem-end browning. Those selected for resistance to stem-end browning were no lower than the parent lot. There appears to be two, and only two, degrees of susceptibility to stem-end browning, highly susceptible, typified by the Keswick strain, and fairly resistant, typified by the Highmoor strain or the Minnesota lot.

Date of Planting and Stem-End Browning. A. Frank Ross. Stem-end browning readings were taken on the tubers from plots planted at 3 different dates and from which samples were dug at 3 different dates (Table 24). Stem-end browning was much lower in the early-planted rows, and increased with each later date of planting. This was true for both the Keswick strain and the Minnesota lot, regardless of the date of digging. It should be noted that the early-planted Keswick was lower in stem-end browning than the late-planted Minnesota lots. This emphasizes the fact that the use of resistant strains will not guarantee low stem-end browning readings under all conditions or that the Keswick strain will always be high. The data in Table 22 from 13 different plots show the same trend, especially in the case of the resistant strains. These data and those in the section on Source of Seed suggest a program that should effectively minimize stem-end browning in Green Mountains: the use of resistant strains and early planting. It has been pointed out elsewhere that early planting will also help to prevent net necrosis. Hence such a program would help to minimize both stem-end browning and net necrosis.

Date of Digging and Stem-End Browning. A. Frank Ross. Progressively later diggings up to late September result in progressively less stem-end browning. (See Tables 24 and 25.) However, late digging, for example October 7, resulted in increased amounts of stem-end browning. The effect of date of digging on stem-end browning varies from year to year. Hence it is apparently related to some unknown seasonal factor.

Effect of Calomel and Other Fungicides on Stem-End Browning. A. Frank Ross. In 1943, calomel greatly reduced the amount of stem-end browning. Repetition of the experiment in 1944 gave less effective control. In Table 25 are presented the results of an experiment where calomel was mixed with the fertilizer at the rate of 5 pounds per acre and samples were dug at 3 different dates. Except for those dug September 27, the calomel reduced the amount of stem-end browning by one half to one third. There was very little difference between the late-dug samples. Larger amounts of calomel were more effective in the case of the Minnesota (low stem-end browning) lot than was the five-pound application but not with the Keswick strain. (See Table 26.) The yield was reduced more also where the Minnesota seed was used. Other mercury compounds were less effective. Other fungicides, such as Semesan, Spergon, Thiosan, Arasan, Cuproside, and C-119, were not effective when applied at the rate of 5 to 50 pounds per acre. It was concluded that the effect of calomel was not due to its fungicidal properties but rather to some effect on the physiology of the plant.

Sodium Chloride and Sodium Sulfate and Stem-End Browning. A. Frank Ross, Bailey E. Brown (U.S.D.A.). Additional evidence that high chloride containing fertilizers are not desirable in potato production was obtained from a plot in which sodium chloride was added to the fertilizer. Two hundred pounds per acre increased the amount of stem-end browning appreciably, and reduced the total solids content of the potatoes slightly. Four hundred pounds per acre decreased the yield appreciably and produced about the same amount of stem-end browning as did the 200-pound application. There was no further reduction in total solids. The plants on the 400-pound plot absorbed only slightly more chloride than did those on the 200-pound plot. The addition of 400 pounds per acre of sodium sulfate did not affect yield, stem-end browning, or total solids to any great extent.

Fertilizer and Stem-End Browning. Joseph A. Chucka, Arthur Hawkins. PERMANENT PLOTS. Tuber samples taken from the permanent plots in 1944 and examined for development of stem-end browning showed about the same effects from fertilizer treatments as were observed in previous years. Stem-end browning tended to increase with the amount of fertilizer applied, with

percentage of potash in the fertilizer, and with the amount of chlorine in the fertilizer. (See Table 16.)

FERTILIZER TESTS ON NEW LAND. Many of the fertilizer treatments on the permanent plots have been repeated on the same land for as many as 18 years. Thus the data on stem-end browning obtained from these plots should be the result of the residual effect of fertilizer treatments. To measure the more immediate effect of certain fertilizer treatments on the development of stem-end browning an experiment was laid out on a piece of land on Aroostook Farm which had not been previously fertilized. The fertilizer treatments used included several rates of application (none, 2500, and 3500 pounds per acre). They included fertilizer without potash and with potash from three different sources and they included treatments with and without added chlorine, boron, and copper. The effect of these treatments on potato yields and on the development of stem-end browning is shown in Table 17. None of the treatments used produced potatoes that were free from stem-end browning. In fact the percentages of stem-end browning developed in the tubers grown on this new land were nearly as high as those obtained from the permanent plots.

BORON IN POTATO FERTILIZERS. Several levels of boron in the form of borax, spent boron catalyst, and boron silicate glass were added to potato fertilizers to study their effect on the development of stem-end browning. These materials tended to reduce somewhat the amount, and particularly the severity, of stem-end browning. They offer no possibility as a corrective measure, however, because they are extremely toxic to the potato plants. Their use resulted in yield reductions all the way from 14 to 73 barrels per acre. (See Tables 18 and 19.)

LATE BLIGHT. Reiner Bonde. The losses caused by late blight were relatively small in most parts of the State in 1944. The disease was found in a number of different places on July 8 and enough sources of infection were present to start an epidemic. However, the progress of the disease was checked by the dry weather that prevailed throughout most of the season.

Effect of Time of Digging on Late-Blight Tuber Rot in Storage. Reiner Bonde, E. S. Schultz.⁷ The losses from late-blight

⁷ Much of the research on potato diseases is cooperative with the Bureau of Plant Industry, Soil, and Agricultural Engineering. Doctor E. S. Schultz is the Bureau representative on this work in Maine.

storage rot sometimes are large in Maine. Much of this rot occurs because the crop is harvested while the foliage is still green and the tubers become infected with late blight from the foliage. A few infected potato leaves or stems in a field are sufficient to inoculate a high percentage of the tubers as they are being harvested.

The results secured for the years 1942 to 1944 show the effect on the amount of late-blight tuber decay that may occur from harvesting while the potato tops are still green. These results were as follows:

Treatment of Tubers	Percentage Tuber Decay in Storage ⁸		
	1942	1943	1944
Harvested and put into storage while part of the foliage was still green and infected with late blight	20	48	53
Harvested and put into storage after foliage had been killed by frost	None	4	6

Storage Temperatures and Late-Blight Rot. Reiner Bonde, E. S. Schultz. Experiments were conducted in 1944 for the purpose of securing further information on the amount of late-blight rot that may occur in potatoes stored at different temperatures. There was little natural infection of late blight in the field, the crop of which was used for these experiments. Therefore, the disease was introduced into the plots by artificial inoculations. While the foliage was still partially alive the potatoes were harvested and placed in storage bins with temperature ranges from 36° F. to 70° F.

Two separate experiments were conducted. One lot was harvested and put into storage on September 10 and the other on September 19. The results of these experiments are given in Table 40.

Very little late-blight decay developed in the tubers stored at 36° F. The amount of late-blight rot increased as the temperature was increased above 36° F. except that there was no significant difference in the development of the rot as the temperature was

⁸ Average from eight 50-pound samples for each treatment after storage for an eight-week period.

increased from 50° F. to 70° F. It was noted that a dry rot occurred at the lower temperatures and at the higher temperature a soft wet rot developed.

Control of Late-Blight Tuber Rot by Killing Tops with Weed Killers. Reiner Bonde, E. S. Schultz. Experiments were conducted in 1943 and 1944 to determine whether or not late-blight tuber rot can be controlled by killing the potato tops with a chemical weed-killer before the crop is dug. The results of these experiments are summarized as follows:

Treatment	Percentage of tuber decay	
	1943	1944
Tubers dug and put into storage while tops were still green	40	54
Tops killed, tubers dug and stored 2 days later ⁹	11	14
Tops killed as above but tubers dug 10 days later ⁹	3	3
Tubers dug and put into storage after tops were killed by frost	6	0

It is apparent that late blight tuber rot can be greatly reduced by killing the infected tops before the crop is dug. It is not safe to harvest the potato crop before the plants are dead if late blight is present. The foliage may be killed by applying a chemical weed-killer when maturity is delayed or when killing frosts occur late in the season.

High-Temperature Treatment for the Control of Late-Blight Rot. Reiner Bonde, E. S. Schultz. An experiment was conducted in 1944 to determine whether a "high temperature" treatment could be used for the control of late-blight decay.

Potatoes were harvested from a field in which the foliage was slightly infected with late blight. These potatoes were divided into uniform 50-pound lots which were subjected to different high-temperature treatments. Each treatment was for a 24-hour period after which the potatoes were put into commercial storage. One lot was treated immediately or soon after being harvested, and

⁹ Tops killed with Sinox used at rate of two gallons of Sinox and 10 pounds of ammonium sulfate in 100 gallons of water applied at rate of 140 gallons per acre.

other lots were treated 24 and 48 hours, respectively, after they had been harvested. Two similar experiments were conducted. (See Table 41.)

The heat treatments did not eliminate the development of late-blight rot. The amount of rot that developed, however, was reduced considerably when the tubers were treated immediately or soon after digging.

The temperature of the treatments fluctuated considerably and for Experiment 1 it dropped to 85° F. during the night. It is possible that better results would have been obtained provided the temperature had been somewhat higher and more constant throughout the period of the treatment.

Potato Refuse Piles. Reiner Bonde, E. S. Schultz. A large number of potato refuse piles were destroyed in 1944 as a result of the campaign for their elimination. However, there were many other refuse piles which were not found and these were a source of late-blight infection for the community. During a search for a period of a few hours three infected refuse piles were found on June 28. Another infected refuse pile was reported as found on June 26.

In some cases cull potatoes are discarded in grain fields or some out-of-way place where they escape detection. Potato growers should make every effort to destroy the growing potatoes in refuse piles and in this way reduce the cost of spraying and the losses from late blight.

Effect of Different Spray Schedules on Yield and Control of Diseases. Reiner Bonde, Clifford Soucy. An experiment was conducted in 1944 to learn the effect of different spray schedules on the control of disease and on the yield rate. Several types of spray schedules were tried similar to those commonly conducted by the farmers of northeastern Maine. One series of plots was sprayed seven times during the season at 7- to 10-day intervals. The first two applications were omitted on a second series of plots and the last two applications were omitted on a third series. Spray applications were omitted twice at what appeared to be critical periods on a fourth series of plots. Late blight was controlled in the plots which received seven spray treatments. A trace of late blight developed in the plots that received the delayed spray schedule in which the first two spray applications were omitted. The season

was very dry, the early late-blight infection made little progress, and the yield was not affected.

Both early blight and late blight appeared in the plots where the two last applications were omitted and the loss of foliage which resulted caused what appeared to be a reduction in the yield rate although this reduction in yield is not significant for these data. Likewise, the omission of two spray applications at the critical period during the spraying season resulted in defoliation of the plants and an apparent reduction in yield. The yields are in accordance with the Protective Coefficient which is an index of the relative amount of disease that resulted from the different spray treatments. (See Table 42, Footnote 2.)

Delayed Spray Program for the Sebago Variety. Reiner Bonde, Clifford Soucy. The Sebago variety has been relatively resistant to late-blight infection in experiments conducted in Aroostook County. It was shown, however, that spraying is highly beneficial in spite of the fact that this variety is resistant to late blight. An experiment was conducted in 1944 to determine whether it would be more profitable to apply fewer applications of fungicides when spraying Sebagos than the normal schedule recommended for the Green Mountain and other susceptible varieties. One part of a field of Sebago potatoes was given eight applications of Bordeaux and another part was given eight applications of Basic Copper Sulfate applied at 8- and 10-day intervals throughout the summer. Other adjacent parts of the same field received only six applications of fungicides, the first applications (July 13 and 20) being omitted.

The yields for the area sprayed with Bordeaux were higher than for the unsprayed section. (See Table 43.) Furthermore, the yield rate for the delayed spray schedule was somewhat more than for the normal schedule. It is of interest to note that spraying with Basic Copper appeared to have caused a reduction in the yield rate for these experiments. Late blight was practically absent from this field and apparently was not a factor which influenced the yields^a secured in these experiments.

Comparison of Different Copper Fungicides. Reiner Bonde, Clifford Soucy. Three of the newer copper fungicides were compared with Bordeaux mixture on the Green Mountain variety. Bordeaux treated plots gave the lowest yield rate in 1944. (See Table 44.) This was true, not only for this experiment but for

others as well. This was in spite of the fact that Bordeaux gave the best control of early and late blight and of flea beetles.

Non-Copper Containing Fungicides. Reiner Bonde, Clifford Soucy. There is a considerable interest on the part of the different chemical companies in the development of non-copper fungicides which can be used effectively for spraying potatoes. A number of these new materials have considerable fungicidal value and show promise as potato spray fungicides.

An experiment was conducted in 1944 comparing certain non-copper fungicides with Bordeaux and with Basic Copper Sulfate which is a neutral copper fungicide. The results of this experiment are summarized in Table 45. The plots sprayed with the non-copper fungicides yielded somewhat more than did the plots sprayed with Bordeaux and with Basic Copper Sulfate, although the differences were not great enough to be considered as significant. No late-blight tuber rot was observed in the plots sprayed with Bordeaux. In contrast the decay was present in the plots sprayed with the other fungicides.

Reduction of Copper and Lime in Bordeaux Mixture. Reiner Bonde, Clifford Soucy. The data secured in 1944 confirm those secured in previous years and showed that the amount of copper and lime in the formula for making Bordeaux may be greatly reduced with no significant reduction in yield rate. (See Table 46.) The yield rate was not significantly reduced by changing the formula from 10-10-100 to 4-2-100.¹⁰ The control of late blight was not a serious problem in 1944, but information was secured on the ability of the different Bordeaux mixtures to control flea beetles. The highest concentration of Bordeaux mixture, namely, 10-10-100, gave the best flea beetle control when applied to the Green Mountain variety. Reducing the lime content in the formula from 10 pounds to 5 pounds per 100 gallons of spray mixture appeared to allow a slight increase in the amount of flea beetle injury when applied to the Katahdin variety. In general the degree of flea beetle injury increased as the copper sulfate and lime were decreased in the formula. This greater amount of flea

¹⁰ The first number of the formula gives the pounds of copper sulfate per 100 gallons of spray material, the second number gives the pounds of lime used per 100 gallons of spray material, and the third number gives the gallons of water.

beetle injury, however, was not sufficient to depress the yield rate in these experiments as much as the yield was increased otherwise.

Basic Copper Sulfate with Rotenone on Katahdin. Reiner Bonde, Geddes W. Simpson, Clifford Soucy. It has been shown in previous studies that the yield rate of the Green Mountain and Sebago varieties was increased when sprays were used containing rotenone in combination with the copper fungicides. It was desired to learn whether the yield rate likewise is increased in the Katahdin variety by applications of rotenone in the spray mixture. The results of this experiment on this problem have been summarized in Table 47. The addition of rotenone to the copper sprays resulted in an increase in yield of 15 barrels (40 bushels) per acre in 1944. This increase is significant at the 1 and the 5 per cent levels, and was sufficient to pay for the additional cost involved for the purchase of the rotenone that was used. It is thus seen that the addition of rotenone to the spray mixture is beneficial and increases the yield rate when used for spraying the Katahdin variety as well as for spraying the Green Mountain and Sebago varieties.

The question naturally arises as to the reason that the addition of rotenone increased the yield rate in these experiments. Both early and late blight were practically absent and were not factors which materially influenced yield. Although there was relatively little disease present, the plots that were sprayed with rotenone were darker green and continued to grow about 10 days longer than did the plots that did not receive rotenone. This longer growth of the plants, no doubt, was responsible for the larger yields that were secured.

There was relatively little flea beetle injury in these plots. It may be noted from the data in Table 48 that the amount of flea beetle damage was approximately the same for plots that received rotenone as for those that did not. Flea beetle control therefore was not the factor affecting the yield rate of the plots that were sprayed with rotenone.

Aphids were extremely abundant in 1944 and caused a considerable amount of damage to the potato foliage, especially to the Katahdin variety. The applications of rotenone, no doubt, reduced the aphid population in the plots included in this experiment and it is probable that this reduction was the chief factor which contributed toward larger yields.

Yield Rate, Early Blight, and Flea Beetle Injury in Green

Mountains Sprayed with Copper Fungicides and Rotenone.

Reiner Bonde, Geddes W. Simpson, Clifford Soucy. Further studies were conducted in 1944 regarding the compatibility of rotenone with copper spray fungicides when applied to the Green Mountain variety. Data were secured regarding the yield rate for the different treatments as well as for the relative control of early blight and flea beetles. (See Table 48.)

The plots which received the Bordeaux mixture spray applications remained green and growing longer than did the plots with other treatments. The Bordeaux plots, also, were infected less with early blight and were injured less by flea beetles than were the plots sprayed with Basic Copper Sulfate and the other materials. However, it may be noted that the yield rate was somewhat less for the Bordeaux treatment than for Basic Copper Sulfate in spite of the fact that the condition of the foliage was superior in the Bordeaux plots. With better weather conditions for the growth of potatoes than prevailed in 1944, the prolonged life of the plants afforded by spraying with Bordeaux would no doubt have resulted in increased yields.

Rotenone increased the control of early blight when in combination with either Bordeaux or Basic Copper Sulfate but had only slight fungicidal value, if any, when applied in the absence of a fungicide. The addition of zinc sulfate to rotenone in the spray mixture did not increase its fungicidal or insecticidal value.

Spray Kast with Basic Copper Sulfate. Reiner Bonde, Clifford Soucy. Many inquiries have been received from farmers regarding the value of Spray Kast for the control of potato diseases and insects.¹¹

A spray mixture of Spray Kast and Basic Copper Sulfate was compared with Basic Copper Sulfate spray used alone regarding the ability to control the blight diseases. The plots received six applications during the season. Observations made just previous to a killing frost revealed no apparent difference in the general appearance of the plots. The comparative yields secured are given in Table 49. The yield was somewhat less on the plots that received Spray Kast in addition to the copper fungicide. This reduction in yield, however, is not significant for these data.

¹¹ Supplied by Woburn Chemical Corp., Harrison, N. J., and said to be giving remarkable results when used on potatoes. Said to contain Cryolite.

Soya Bean Oil with Basic Copper Sulfate. Reiner Bonde, Clifford Soucy. Information secured in 1943 showed that the addition of soya bean and herring oil to the spray mixture increased the amount of metallic copper that was retained on the leaves. Further information was obtained in 1944 regarding the value of adding oil to the copper fungicide using the Green Mountain variety and Basic Copper Sulfate. Soya bean oil was used instead of fish oil because it is less toxic to the potato foliage. The plots received six applications of spray.

The formula for making the spray material is as follows:

Basic copper sulfate.....	5 pounds
Soya bean oil.....	1 quart
Santomerse (detergent).....	1 pint
Water.....	100 gallons

The addition of soya bean oil caused no apparent difference in the general appearance of the sprayed foliage. This is in contrast with data secured in 1943 when the addition of an oil resulted in greener foliage and a delay in date of maturity of the plants. The plots sprayed with the oil fungicide yielded only a barrel more per acre than did the control plots which received no oil which also is contrary to the results secured in 1943. (See Table 50.)

Puratized N5-X.¹² Reiner Bonde, Clifford Soucy. An experiment was conducted in 1944 to determine whether "Puratized N5-X" has fungicidal properties and can be used for spraying potatoes for the control of early and late blight. The plots were sprayed six times during the season using a horse-drawn wheel-traction outfit which applied approximately 100 gallons of spray per acre. Late blight was absent from these plots and, therefore, no information was secured regarding the ability of the material to control this disease. However, the general appearance of the plots sprayed with Puratized N5-X was inferior to that of the control plots which were sprayed with Basic Copper Sulfate.

The yield rate for the plots sprayed with Puratized N5-X at the rate of 1-1000 was slightly less than for the controls and was

¹² Puratized N5-X supplied by Puratized, Inc., 250 West 43rd St., N. Y., N. Y., said to contain 11.6 per cent toxicant. Said to control apple scab at a concentration of 1-1000 by volume which is a dilution of 1-8620 of the toxicant.

significantly less when the concentration of the Puratized spray mixture was increased to 2-1000. (See Table 51.) It would appear that this material is toxic to the plant when used at this concentration. It should be recalled that Puratized N5-X was very toxic to cut potato seed pieces and greatly reduced the stand, even when used at low concentrations, namely, 1 part in 1000 by volume (1-8520 of the toxicant).

PURPLE TOP. Reiner Bonde. *Purple Top Transfer by Inarch Grafts.* In previously conducted experiments the symptoms of purple top were not transmitted by means of tuber grafts. The disease also was not produced when plants grown from the seed tubers of purple top hills were grafted by the inarch method into healthy plants. During the season of 1943 attempts were made to transmit the disease by the "inarch" graft method using plants that had current season symptoms of purple top.

No purple top symptoms were apparent either during the current season or in the plants that were produced when the tubers from grafted plants were planted the following spring. (See Table 52.) It, however, may be noted that the inarch grafts did result in the development of weak sprouts in all of the three lots. The data indicate that some virus or other substance was transmitted from the diseased plants to the healthy plants as a result of the inarch grafts and resulted in the production of weak sprouts.

Recovery of Seed Stocks Having Purple Top. Studies were continued in 1944 to obtain additional information regarding the recovery of seed stocks having purple top. In 1943 a seed stock one year removed from purple top yielded about 85 per cent as much as did the healthy controls. A seed stock which was two years removed from purple top yielded 54 barrels more per acre than did the healthy control seed stock. The seed stocks were all stored under the same conditions and received the same cultural treatments during the growing season. Eighteen 4-hill replicated plots were included for each seed lot. The tubers were harvested by hand and the weights of tubers obtained were recorded in the field.

The yield rate from the seed stocks which had recovered from purple top was in no case significantly less than it was for the healthy control seed lots. (See Table 53.) Seed lots nos. 1, 2, 6, and 7 yielded somewhat more than did the healthy controls. Seed lots nos. 3 and 4, in contrast, yielded somewhat less than the con-

trols. However, both of these lots had approximately 13 per cent leafroll, a factor which probably depressed the yield rate somewhat.

Thus the data secured in 1944 confirm those secured in 1943 that the purple top disease does not permanently depress the yield rate in the Sebago and the Katahdin varieties. In fact the data of 1943 and 1944 both indicate that purple top may increase the yield rate after the seed stock has recovered from the shock of the initial infection.

The reason that the seed stock which had recovered from the disease yielded more than did that from seed stocks that never had the disease is not understood. It was observed in the experiments recorded above that the tubers that had recovered from purple top produced more stems than did the tubers from healthy plants. It also was noted that all of the eyes of the disease recovered seed stocks germinated and produced vigorous sprouts. In contrast, there was a tendency for only the apical bud of the tubers from the healthy seed stocks to produce vigorous sprouts. Such apical-dominance sprouting no doubt would affect the yield rate.

Tests for Possible Acquired Immunity to Purple Top. Studies have shown that the tubers from hills infected with purple top may recover from the severe effects of disease (Bonde, Maine Bul. 426, p. 243). Many tubers from infected hills when planted produce only small tubers attached to the mother tuber and so produce no plant foliage. The tubers from purple top plants also may produce weak sprouts and plants. However, the seed tubers from these weak plants will produce plants that are normal in appearance and in their yielding ability when planted the following season. The question naturally arises as to whether or not the seed stock* that has recovered from purple top is immune to the disease.

Katahdin and Sebago seed stocks selected in 1941 and 1942 from purple top hills were used for a study of this question. All of these stocks apparently had recovered from the disease and had produced normal plants and a good crop in 1943. They were planted by hand along the border of a field where it was expected the disease would be prevalent. Some of the seed tubers were planted whole and some were cut as is commonly done in Maine.

Very little purple top was present in the plants included in the test. (See Table 54.) This was in spite of the fact that the six-spotted leaf hopper was very abundant in Aroostook County during

1944. The aster yellows disease also was prevalent in the near vicinity of the field in which this experiment was conducted. The six-spotted leaf hopper was so abundant that every lettuce plant in two nearby plots contracted the aster yellows disease. The aster yellows disease also was prevalent in carrots and other cultivated and wild plants grown in the vicinity of the potatoes which were being tested regarding their immunity to purple top.

Although the disease was not prevalent in these plots, the data do indicate that the seed stock which had recovered from purple top was not immunized toward further infection. A trace of purple top developed in Lots 6 and 7 which were selected in 1941 and in Lots 8 and 9 which were selected in 1942.

Aphid Population on Healthy and Purple Top Plants. It has been observed that plants having the purple-top disease apparently had a denser aphid population than did the nearby healthy plants in the same field. It seemed of value to determine whether this was true by making actual counts under field conditions. Healthy and purple-top plants of the Sebago variety were compared. The data were secured by counting all of the aphids that were present on one terminal leaflet selected from the top, middle, and bottom parts of healthy and diseased plants. Aphid counts were made on 22 healthy and 22 diseased plants. (See Table 55.) The aphid population was much denser on the plants infected with purple top than it was on the healthy plants. There was an average of 33 aphids per leaflet on the top part of the healthy plant compared with an average of 73 aphids per leaflet on the diseased plant, the ratio being 2.2:1. There were 3.1 times as many aphids on the middle leaflets of the purple-top plants as there were on the leaflets from the middle part of the healthy plants. The bottom leaflets of the healthy plants had an average of 39 aphids compared with an average of 89 aphids on the bottom leaves of the diseased plants. Taking the plants as a whole, there were 2.5 times as many aphids on the plants infected with purple top as there were on the healthy plants.

These data confirm the contention that plants infected with purple top may have a higher infestation of aphids than do the healthy plants in the same field. Purple-top plants apparently have an accumulation of food material which is not translocated to the tubers. This food material which accumulates in the leaves seems to be favorable for the development of the aphids.

SEED DISINFECTION OF POTATOES. Bernie E. Plummer, Jr., Reiner Bonde. Further study was made of the use of acid mercuric chloride and non-acidulated mercuric chloride solutions in the disinfection of seed potatoes. One half of one per cent acetic acid with mercuric chloride was used in 5- and 90-minute dips. Mercuric chloride barely acidulated with hydrochloric acid was used in a 5-minute dip. A standard dip using non-acidulated mercuric chloride was studied.

All of the acidulated samples retained nearly their original strength of mercuric chloride even up to 25 consecutive dips. The standard non-acidulated dip lost nearly half its mercuric chloride content during 25 dips. The addition of a small amount of acid therefore prevents the loss of mercuric chloride from solution when used in the disinfection of potatoes. (See Tables 56 and 57.)

FOUNDATION SEED PROGRAM. Wesley F. Porter, Roger M. Cobb, Donald Merriam, Geddes W. Simpson. Several recommendations are considered essential to the successful growing of foundation seed. Among the more important are (1) a source of seed known to be free of bacterial ring rot, (2) a source of seed with a low virus content, (3) early planting by tuber units, (4) adequate isolation from other fields of potatoes, (5) careful thorough roguing, (6) clean cultivation, (7) early harvesting, especially in years when plant lice are abundant, (8) storage on the farm where contamination of seed stocks will not occur, and (9) advance testing of seed to insure quality for the next year's planting.

Observations in Florida have indicated that many seed stocks of the newer varieties are badly infected with various latent mosaics. It was decided several years ago that the Foundation Program could serve a more useful purpose if seed stocks free from latent mosaic could be produced and distributed since experimental data had shown that these mosaics are capable of reducing yields materially.

Seed stocks from what were considered the best lots were tested in the greenhouse using *Datura* plants during the winter of 1940-41 and certain tubers found to be free from latent mosaics were multiplied at McNally. These stocks have been retested from time to time and have been released as rapidly as they could be built up. Recently, all available stocks have been fed into the Foundation Program where they are being multiplied by foundation growers who in turn sell to certified seed growers. Eventually it is hoped

that this system of selecting the best possible stocks may be expanded so that in time there will be a flow of good seed from the greenhouse test right through to the table-stock grower.

In 1944, 37 growers entered approximately 342 acres in the Foundation Program. This acreage is the largest ever entered in the program. The acreages and the varieties entered were: 135 acres of Green Mountains; 38.5 acres of Sebagos; 32.9 acres of Katahdins; 85.7 acres of Irish Cobblers; 41.7 acres of Chippewas; .75 acre of Sequoias; 7.2 acres of Mohawks; 1.5 acres of Houmas; 0.1 acre of Early Rose. The total acreage was planted in 112 different plots. The plots were located in the counties of Aroostook, Penobscot, and Piscataquis.

In general the most satisfactory results cannot be obtained when seed plots are planted later than May 20. In 1944 planting dates ranged from May 5 to May 22. Very few plots were planted after May 20.

Most plots were rogued once a week for a period of six weeks beginning the last week in June. Nearly all plants showing symptoms of leafroll and mosaic were removed from the plots by July 20.

Experience has shown that early harvesting is one of the most important factors in the control of leafroll. It is evident that information gained from records of aphid flights can be used successfully in determining the time when early harvesting operations must be started. From studies conducted on aphid flights at Aroostook Farm in 1944, it was apparent that the most satisfactory results would be obtained if early harvesting was completed by August 12. In 1944 early harvest dates ranged from August 5 to August 20. A number of growers early harvested later than August 12 because of unsatisfactory yields. In such cases most growers sacrificed quality of seed for quantity.

Owing to a labor shortage this year several growers early harvested by killing the tops with chemicals. Hand pulling the tops was recommended as the most effective method for virus control. If labor was unavailable to pull tops on the whole plot, it was recommended to each grower to early harvest enough seed for his 1945 seed plot by hand pulling and kill the tops on the remainder of the plot by using chemicals. Good results were obtained with chemicals on the Irish Cobbler and Chippewa varieties where the killing was done early and a complete killing of the vines was

obtained. The results obtained by the use of chemicals in comparison to hand pulling are listed below.

	Tops hand pulled	Tops killed with chemical	Late harvest
Number of plots	53	31	13
Number of plots with Florida samples under 2 per cent leafroll	50	9	6
Percentage of samples in Florida test below 2 per cent	94.3	29.0	46.1

Samples were taken from the foundation plots and grown in Florida during the winter of 1944-1945 to determine the amount of virus disease present in the different lots.

A summary of the acreage of each variety qualifying as foundation seed is given in Tables 58 and 59.

POTATO SCAB. Joseph A. Chucka, Ferdinand H. Steinmetz. Two blocks of 100 plots each were laid out at Aroostook Farm on a field that had a pH of about 5.5 to study the effect of pH and several types of added organic matter on the incidence of potato scab. To secure a range in pH, 40 plots in each block were treated with sulfur, 40 plots were treated with limestone, and 20 plots were left untreated. Across the sulfur and lime treatments several types of organic matter (oat stubble, buckwheat, crimson clover, oat straw, manure, and peat) were plowed under. The buckwheat and crimson clover were grown and plowed under on the plots while the straw, manure, and peat were applied to some of the oat stubble plots and plowed under.

Each year one block of 100 plots is planted to oats, buckwheat, and crimson clover while the other block of 100 plots is planted to potatoes. The effect of these treatments on pH, scab, and potato yield in 1944 is shown in Table 60. The plots are divided into four groups based on the amount of potato scab developed on the tubers. Clean tubers were produced on 38 plots, tubers with only a very small amount of scab were produced on 20 plots, tubers with considerable scab were produced on 19 plots, and very scabby tubers were produced on 23 plots. The plots which produced clean potatoes had a pH range of 4.08 to 5.41. The plots which produced

scabby potatoes ranged in pH from 4.52 to 6.28. The amount of scab on the tubers was definitely correlated with pH but there was considerable overlapping in pH between the groups of plots. The average content of replaceable calcium was also definitely correlated with the amount of scab on the tubers. There was only a slight tendency for the replaceable potassium to go up with increasing amounts of scab. In general the dividing line between clean potatoes and scabby potatoes was at a pH of 5.5 and a replaceable calcium content of 2000 pounds per acre.

The kind of organic matter added had comparatively little effect on the incidence of potato scab. At a pH of about 5.5 (the border line between clean and scabby potatoes) the addition of manure had a slight tendency to increase the amount of scab while plowing under crimson clover or buckwheat tended to decrease scab slightly.

SOIL FERTILITY

FERTILIZATION. *Fertilizer Ratio Test.*¹⁸ Arthur Hawkins, Joseph A. Chucka, Bailey E. Brown. Four levels of nitrogen (40, 80, 120, and 160 pounds of N per acre), three levels of phosphoric acid (60, 120, and 180 pounds of P_2O_5 per acre) and four levels of potash (100, 160, 220, and 280 pounds of K_2O per acre) were compared on each of four farms during 1944. No increases in yield were obtained with increased plant food beyond 80 pounds of nitrogen, 120 pounds of phosphoric acid, and 160 pounds of potash. The highest level of nitrogen (160 pounds N per acre) and the two highest levels of potash (220 and 280 pounds of K_2O per acre) not only failed to increase yields but actually depressed them. This rather low response to plant food in 1944 may have been due to the rather inadequate rainfall.

Fertilizer Placement. Joseph A. Chucka, Arthur Hawkins, Bailey E. Brown. In one placement experiment with potatoes at Aroostook Farm all plots received a 6-6-12 fertilizer at the rate of 2000 pounds per acre. In treatment 1, all of the fertilizer was

¹⁸ The studies with potato fertilizers are cooperative with the Division of Soil and Fertilizer Investigations, and the Division of Fruit and Vegetable Crops and Diseases. Arthur Hawkins and B. E. Brown, respectively, are the representatives of these Divisions on these studies in Maine.

placed in the row in bands at planting time. In treatment 2, one half of the fertilizer was applied in the row while the remainder was broadcast prior to plowing. In treatment 3, one fourth of the fertilizer was applied in the row and three fourths was applied broadcast prior to plowing. In treatment 4, one fourth of the fertilizer was applied in the row and three fourths on the plow sole at the time of plowing. In treatment 5, one half of the nitrogen and one half of the potash and all of the phosphoric acid were applied in the row and the remainder of the nitrogen and potash was applied broadcast prior to plowing. Treatment number 6 was similar to number 5 except that the remainder of the nitrogen and potash was applied broadcast after plowing. An average of four replicated plots produced the following yield rates of potatoes in barrels per acre: 133, 132, 124, 127, 130, and 133 respectively for the six treatments described above. Broadcasting three fourths of the fertilizer prior to plowing (treatment number 3) resulted in a significantly lower yield than placing all of the fertilizer in the row. The other split-application treatments were nearly as good as, but no better than, the standard band placement method (treatment number 1).

In a second placement experiment with potatoes conducted on a farm near Lee, Maine, only two treatments were compared. One consisted of placing 1800 pounds of 6-9-15 fertilizer in the row at planting time and the other consisted of 600 pounds of 6-9-15 in the row and 1200 pounds of 6-9-15 applied on the plow sole. The plowing was done in the spring about 10 days prior to planting. The fertilizer was applied on the plow sole in two bands with an International distributor attached to the plow. Each plot consisted of 18 rows of potatoes about 800 feet long. The potatoes on the split-application plot grew larger vines but due to the extremely dry and hot weather the plants on both plots died prematurely and produced a very low yield. The plot receiving all of the fertilizer in the row produced 72 and the split-application plot produced 77 barrels of potatoes per acre.

Permanent Plots. Joseph A. Chucka, Arthur Hawkins, Ferdinand H. Steinmetz, Bailey E. Brown. The 1944 potato yields from the permanent plots are in general agreement with those secured in previous years and summarized in Bulletin 414. In the rate of fertilizer application series in which 0, 1500, 2000, 2500, and 3000 pounds per acre of a 4-8-8 fertilizer were compared, the

potato yields increased with amount of fertilizer applied up to the 2500 pound rate. In the fertilizer ratio series in which each of the three major elements was varied while the other two were held constant, potash again was the most effective in increasing potato yields. Responses in yield to potash were obtained up to a rate of 240 pounds of potash per acre. In the series comparing sources of nitrogen, highest yields were secured with the 4-8-8 fertilizer in which all of the nitrogen was supplied as urea. Potassium chloride and potassium sulfate used as sources of potash at the rate of 160 pounds of K_2O per acre produced approximately equal yields on the permanent plots in 1944.

On four plots in the two-year rotation series a fertilizer placement study was conducted in 1944. All four plots received a total of 2500 pounds per acre of a 4-8-10 fertilizer. On plot 1 all of the fertilizer was placed in the row in bands at planting time. On plot 2, three fourths of the nitrogen was broadcast and harrowed in prior to planting, the remainder of the nitrogen and all of the phosphoric acid and potash were applied in the row. On plot 3, three fourths of the nitrogen and three fourths of the potash were applied broadcast prior to planting and the remainder of the nutrients was applied in the row at planting. On plot 4, three fourths of the 4-8-10 was applied broadcast prior to planting and the remainder in the row at planting time. The plots receiving the split applications of fertilizer produced slightly lower yields than did the plot which received all of the fertilizer in the row at planting time.

Minor Element Studies. A. Frank Ross, Arthur Hawkins (U.S.D.A.), Joseph A. Chucka. Tables 28 and 29 record the effect of several minor elements on yield. Two commercial products, Es-Min-El and Milorganite, reported to contain several minor elements, are also included in the tables. Contrary to previous results, strontium failed to significantly increase the yield. Es-Min-El, Milorganite, and the various minor elements, in the amounts used, all failed to produce any increase in yield. On the other hand, cobalt at the rate of five pounds per acre caused a very significant decrease in yield. Both vanadium (two pounds per acre) and the minor element mixture caused decreases in yield that are probably significant. The presence of bromide salts in the amounts commonly found in commercial fertilizers was found to have no effect upon yield.

SEED STOCK PRACTICES

Methods may be found to treat seed stocks with chemicals, vary the size of seed pieces planted, etc., as means for controlling the average number and size of tubers. These procedures may be of particular interest to seed growers but may have a bearing, also, on table-stock production.

Size of Seed Piece and Potato Yields. Joseph A. Chucka, Ferdinand H. Steinmetz. This experiment was conducted at Aroostook Farm with three varieties of potatoes—Green Mountain, Katahdin, and Sebago. The lots of seed potatoes used were as nearly disease-free as could be obtained. The seed potatoes of each variety were carefully graded into the following size ranges: 1 to $1\frac{1}{4}$ inches, $1\frac{1}{4}$ to $1\frac{1}{2}$ inches, $1\frac{1}{2}$ to $1\frac{11}{16}$ inches, $1\frac{11}{16}$ to $1\frac{7}{8}$ inches, and $1\frac{7}{8}$ to $2\frac{1}{2}$ inches. The first four size ranges were planted whole and a portion of those ranging in size from $1\frac{11}{16}$ to $1\frac{7}{8}$ (large seconds) was split in two. From those ranging in size from $1\frac{7}{8}$ to $2\frac{1}{2}$ inches seed pieces of three sizes, 1 ounce, $1\frac{1}{2}$ ounces, and 2 ounces, were cut. This resulted in four lots of whole seed and four lots of cut seed of each variety. All lots of seed were planted nine inches apart in 36-inch rows on each of six replicated single row plots 24 feet long. Although the 1944 yields were considerably smaller than those secured in 1943, they were again correlated with size of seed piece. (See Table 61.) The yields increased with size of seed piece for both whole and cut seed. Whole seed pieces of a given weight produced somewhat higher yields than cut seed pieces of similar weight.

Plant, stalk, and tuber counts indicated that the number of stalks per plant and the number of tubers per hill increased as the size of seed piece planted increased. See figure 1. Grading data indicated a somewhat higher percentage of oversize tubers on the plots where the smallest seed pieces were planted.

Physiological Seed Treatments and Size and Numbers of Tubers. George P. Steinbauer, Ferdinand H. Steinmetz. Six chemical treatments of seed and two different spacings of seed pieces were used in addition to a control. (See Table 62.) Seed of the Green Mountain variety was used with 12-inch seed spacing unless otherwise noted. The seed was planted in 25 foot rows, with six randomized replicates per treatment. At harvest time records were obtained for number of stalks per hill, number of

stalks per replicate, and the weight and number of tubers. Tubers were graded into culls (less than $1\frac{1}{4}$ inches), $1\frac{1}{4}$ to $1\frac{7}{8}$ inches, $1\frac{7}{8}$ to $2\frac{7}{8}$ inches, and over $2\frac{7}{8}$ inches. The data obtained are presented in Table 62.

All of the chemical treatments, except the use of indole acetic acid, and the two close spacings of seed piece gave highly significant increases in total numbers of tubers over the control and either significant or highly significant increases in numbers of tubers in the preferred size group ($1\frac{1}{4}$ to $2\frac{7}{8}$ inches). These same treatments resulted in fewer oversize tubers than in the control. Total weight of tubers was significantly higher for the closer spacings than for the control. Transplantone and thiourea produced more stems per seed piece than other treatments.



FIGURE 1. Effect of size of whole and cut seed pieces.

1. Whole tubers 1 to $1\frac{1}{4}$ inches in diameter
2. Whole tubers $1\frac{1}{4}$ to $1\frac{1}{2}$ inches in diameter
3. Whole tubers $1\frac{1}{2}$ to $1\frac{11}{16}$ inches in diameter
4. Whole tubers $1\frac{11}{16}$ to $1\frac{7}{8}$ inches in diameter
5. Split seconds
6. One-ounce seed pieces from tubers $1\frac{7}{8}$ to $2\frac{1}{2}$ inches in diameter
7. One and one-half ounce seed pieces from tubers $1\frac{7}{8}$ to $2\frac{1}{2}$ inches in diameter
8. Two-ounce seed pieces from tubers $1\frac{7}{8}$ to $2\frac{1}{2}$ inches in diameter

In addition to the seed treatments three organic chemicals¹⁴ naphthaleneacetic acid, 2, 4-dichlorophenoxyacetic acid and betanaphthoxyacetic acids were applied to the foliage as aqueous sprays at about the time that tuber formation was initiated. Concentrations ranged from 50 mg. per liter to 300 mg. per liter. Response to naphthaleneacetic acid was a decided bending or epinasty of the leaves shortly after spraying. This response persisted for 48 to 96 hours. Response to the other two chemicals was a tendency for the leaflets to become ruffled and of smaller size than on the controls. Numbers of tubers per unit length of row were not significantly greater for treated than untreated plots.

These results offer promise that some practical methods may be devised for producing larger numbers of medium sized tubers than is usually the case, without using additional quantities of seed.

STORAGE

LOSS OF WEIGHT FROM POTATO TUBERS DURING STORAGE.

Elizabeth F. Murphy. It may be of some interest to the potato grower to know the relative weight losses which occur in six popular varieties during storage at various temperatures. Several hundred freshly dug tubers were brushed free of soil and weighed individually. The weights were marked on the tubers which were then placed in storage bins at five temperatures. At monthly intervals for seven months, six tubers of each of the six varieties from each storage bin were removed for analysis. The tubers were weighed again and the fresh and stored weights recorded. Sprouts were removed from the tubers as these would not be considered either in marketing potatoes or in nutritional value.

The temperatures used in this study were 32, 36, 50, 60 and 70° F. It was observed that when all five temperatures were considered, the Sebago's lost the largest percentage of their original weight, averaging 13.2 per cent for the whole period. Mohawk showed a mean decrease in weight of only 7.5 per cent. A progressive weight loss during seven months for all varieties averaged 2.4 per cent after one month in storage and 19.9 per cent after seven months. Thirty-six degrees favored a minimum loss and

¹⁴ These chemicals were furnished by Dr. P. Zimmerman of the Boyce-Thompson Institute.

50° was superior to 32° F. (See Table 65.) The higher weight loss at 32° was probably due to the severe internal mahogany browning which affected most of the tubers at that temperature.

As potatoes would not be stored at 60° or 70° F. for commercial purposes, average losses were calculated for the three lower temperatures, 32°, 36°, and 50° F. When the changes in weight are judged only by these three temperatures, it was found that Cobbler and Katahdin exhibited the lowest average losses over seven months (4.3 per cent each) while Sebago showed the highest loss at 8.7 per cent. The average weight decreases by varieties, months, and temperatures are shown in Table 65.

POTATO PRODUCTS

During the past ten years, production capacity of potato starch in Maine has more than doubled. Modernization has been most helpful in increasing percentage yields at a time when Maine cull potato prices have risen and starch content of potatoes has decreased. Some European varieties grown under commercial conditions in the Houlton district contained 13.2 to 18.5 per cent starch and may deserve some consideration from the postwar viewpoint as possibilities to be grown on a contract basis for starch manufacturers.

EXPERIMENTAL POTATOES. Charles A. Brautlecht. Sixty-seven lots of experimental potatoes, grown at Aroostook Farm, Presque Isle, by R. Akeley of the Bureau of Plant Industry, under comparable conditions, were examined for starch. Twenty-eight lots represented 20 domestic varieties. Starch content, number of tubers to 5 kilograms, weight of 5 kilograms in water, experimental total solids and computed total solids were determined. Total solids computed from specific gravity by the Foth table (1907) and determined experimentally, showed differences of from -0.66 to +2.74 per cent. The ratio of total solids to starch for these 28 lots of domestic varieties varied from 1.36 to 1.76 with an average of 1.575. For a number of domestic varieties and foreign varieties, 1943 crop, this ratio was from 1.4 to 1.8. The limits in starch were from 9.65 per cent (Chippewas) to 15.00 per cent for an unnamed variety. (See Tables 63 and 64.)

QUALITY OF STARCH FACTORY POTATOES. Charles A. Brautlecht. Twenty-nine samples of potatoes from starch factory hoppers or cellars were examined with the following results:

Potato starch by balance	Maximum	13.7 per cent
	Minimum	2.5 per cent
	Average	10.3 per cent
Number of potatoes to 5 kilograms	Max. (size)	14.0 per cent
	Min. (size)	93.0 per cent
	Average	42.0 per cent
Sound, marketable as table stock, over two inches		very few
Sound, under two inches		some
Bulls		none to few
Digger cuts		few to many
Off shape		none to a few
Sunburn		none to 40 per cent
Net necrosis		none to a little
Chilling injury, field and storage frost		none to much
Scab		none to a little
Late blight		none to much
Stem-end browning		none to a little
Wilt (ring rot)		none to a little
Late blight storage rot		none to some
Silver scurf		none to a little
Hollow heart		none to a little
		(usually in Katahdins)
Floaters		none to many
Number of eyes in Sebagos and Katahdins		about 11
Number of eyes in Green Mountains		about 17
General market appearance		very poor to a few good lots
Suitability for starch manufacture		very poor to a few good lots

POTATO STARCH CHARACTERISTICS. Charles A. Brautlecht. Thirty-one samples of potato starch from the 1944 crop were examined with the following results:

	Av.	Max.	Min.
Moisture (water per cent)	17.2	25.0	11.0
Total solids (by difference) per cent	82.8	89.0	75.0
Ash per cent	0.29	0.43	0.10
Viscosity, 1 per cent solution in 0.6 per cent NaOH at 20°, centipoises (Stormer)	3.3	4.5	2.7
Granule size, average, microns	37	47	22
Acid (cc. n/10 NaOH per 25 gram sample)	5.2	13.0	0.5
Reflectance (whiteness) to MgO per cent	92.0	99.9	83.1
pH (Hellige)	6.5	7.5	6.0
Solubles per cent	0.16	0.39	0.5

Comments: Fiber, nitrogen, and fat (ether extract) are absent from the two best of four grades of Maine potato starch. Speck count increased for the 1944 crop season, relative to the 1943 crop season, due to poorer quality potatoes, poorer fuel and lack of suitable labor.

ECONOMICS OF THE POTATO INDUSTRY

WARTIME CONDITIONS AND PRODUCTION OF POTATOES. William E. Schrupf. The information for this study was obtained in 1944 chiefly from two sources. The first was 365 replies to a mailed questionnaire received from potato growers in the different potato-producing areas of Maine. This questionnaire supplied information concerning cropping methods, soil erosion, potato varieties, labor, seed, fertilizer, and the cost of production. The second was a 10 per cent sample of more than 55,000 Federal-State shipping point certificates of potatoes inspected in 1942 and 1943. These Federal-State certificates supplied information concerning the quality of the potato crop as indicated by the percentage of U. S. No. 1 grade defects.

Cropping Methods. Analysis of the records of the 365 Maine potato farms indicates that cropping methods were affected considerably by the increased potato acreage resulting from wartime demand.

There was an increase in cropland acreage as well as in potato acreage. From 1942 to 1944 the potato growers on these farms

increased the acres of cropland more than 7 per cent, partly by purchase, partly by hiring, and partly by using land formerly in pasture or woods. However, the crop acreage increase was not uniform. In central Aroostook the cropland increase from 1942 to 1944 was slightly less than 7 per cent; in northern Aroostook it was 4 per cent; and in southern Aroostook nearly 15 per cent.

The potato acreage on the 365 farms in this study increased about 30 per cent from 1942 to 1943 but decreased between 2 and 3 per cent from 1943 to 1944. Neither the increase in potato acreage from 1942 to 1943 nor the decrease from 1943 to 1944 was uniform as between the different areas. From 1942 to 1943 the increase in northern Aroostook was 35 per cent, in southern Aroostook 35 per cent, in central Aroostook 27 per cent, and on potato farms outside Aroostook 26 per cent. Although the potato farms as a whole showed a decrease in potato acreage from 1943 to 1944, the potato acreage in the northern area increased about 9 per cent and the acreage of the southern area showed no change. The potato acreage of the farms outside of Aroostook, however, decreased 10 per cent from 1943 to 1944 and the central Aroostook acreage decreased 6 per cent. In spite of the slight average drop in the potato acreage of the farms from 1943 to 1944, the 1944 acreage in each area was substantially above the 1942 acreage. In northern Aroostook the 1944 potato acreage was 46 per cent above 1942, 35 per cent above in southern Aroostook, 19 per cent above in central Aroostook, and 13 per cent above on farms outside of Aroostook.

Farmers have maintained an increased potato acreage partly by interrupting normal cropping methods. In order to conserve time, labor, and equipment farmers have tended more than normally to follow potatoes by potatoes on the same land. Before the war-time increase in potato acreage, normally less than 50 per cent of the potatoes were planted on land that had been in potatoes the previous year. Of the 1943 potato acreage, 65 per cent had been in potatoes in 1942, and of the 1944 acreage approximately 70 per cent had been in potatoes in 1943. This trend toward replanting of potato land seems likely to continue as long as there is a shortage of labor and equipment combined with a patriotic and price incentive to produce.

Soil Erosion. As an indication of the effect of the large war-time increase in potato acreage on soil erosion in Maine, the farmers were asked whether or not they observed increased erosion on their

farms since 1942. Replies from farmers who indicated that the topography of their farms was flat were omitted. Of the approximately 300 farmers whose replies were used, 18 per cent answered "yes" and 82 per cent answered "no." Increased erosion was observed less on small farms than on large farms. On the relatively small farms (less than 40 acres of potatoes per farm) about 14 per cent of the farmers reported increased erosion, on medium size farms (40 to 79 acres of potatoes) 24 per cent, and on relatively large farms (80 or more acres of potatoes) 32 per cent.

Potato Varieties. Of the different varieties of potatoes grown on these farms in 1944, Green Mountain ranked first from the point of view of acreage, Katahdin second, and Irish Cobbler third. The Green Mountain variety in 1944 accounted for 36 per cent of the potato acreage, Katahdin 28 per cent, Irish Cobbler 13 per cent, Sebago 11 per cent, Chippewa 7 per cent, Houma 3 per cent, and other varieties 2 per cent. The Green Mountain acreage exceeded the Katahdin acreage in northern and central Aroostook but not in southern Aroostook. In northern Aroostook 68 per cent of the 1944 potato acreage was Green Mountain and 16 per cent Katahdin, in central Aroostook 27 per cent was Green Mountain and 25 per cent Katahdin, but in southern Aroostook 19 per cent was Green Mountain and 49 per cent Katahdin.

Farm Labor. Year help was reported on 48 farms, month help on 68 farms, and day help on 221 farms. Information concerning wages for cutting seed potatoes was supplied by 250 farmers and for picking up potatoes by 292 farmers.

The average cost of year help in 1943 was \$1,404. Wages of year help were highest (\$1,608) in central Aroostook and lowest (\$1,212) on potato farms outside of Aroostook. In northern Aroostook the average was \$1,236 per year and in southern Aroostook \$1,296 per year.

Month wages in 1943 averaged \$112 and ranged from \$92 on potato farms outside Aroostook to \$121 on farms in central Aroostook. In northern Aroostook, the month wage rate was \$101 and in southern Aroostook \$119.

The average day wage rate was nearly \$6.00. Day wages varied from less than \$4.00 to \$10.00 or more. Wages were less than \$4.00 per day on 6 per cent of the farms and \$10.00 or more on 11 per cent. On nearly half of the farms (49.3 per cent) the

wage rate was \$4.00 to \$5.99 per day. Day wages were lowest (\$4.73) on potato farms outside of Aroostook and highest (\$6.82) on farms in central Aroostook.

Wage rates paid for cutting seed potatoes averaged 45 cents per barrel and ranged from less than 30 cents to 60 or more cents. The most common rate was 50 cents per barrel. This was the rate on more than one half (55.6 per cent) of the farms. The rate was less on small farms (44 cents per barrel on farms having less than 40 acres of potatoes per farm) than on large farms (48 cents per barrel on farms having 80 or more acres of potatoes per farm). In northern Aroostook the rate was 40 cents, on potato farms outside Aroostook 43 cents, in southern Aroostook 45 cents, and in central Aroostook 48 cents.

The average cost of picking up potatoes was 17 cents per barrel and the range was from 15 cents to 22 cents. In southern Aroostook and on potato farms outside Aroostook the average cost of picking up potatoes was 16 cents per barrel. In northern Aroostook this cost was 17 cents and in central Aroostook 18 cents.

Seed Potatoes. Of the potato acreage planted on 268 farms furnishing the information, 74 per cent was planted with certified seed in 1944. The percentage planted with certified seed varied from 32 per cent in northern Aroostook to 89 per cent in southern Aroostook. A smaller percentage of the potato acreage on small farms was planted with certified seed than on large farms. On the farms having less than 40 acres of potatoes per farm, 53 per cent of the acreage was planted with certified seed and on the farms having 80 or more acres of potatoes per farm, 88 per cent. The average planting per acre of all seed potatoes on these farms was 9.0 barrels and the average cost of the seed per acre was \$42. Plantings of certified seed averaged 9.3 barrels per acre and of seed not certified 8.2 barrels. The average cost of certified seed was \$46 per acre and of seed not certified \$29 per acre.

Commercial Fertilizer. The average application of commercial fertilizer on the 341 farms that supplied the information was 0.9 ton per acre and the average cost was \$44 per acre. The average per-acre application varied but little between the different areas. The per-acre cost, on the other hand, did vary somewhat. This cost was \$41 per acre in southern Aroostook, \$43 per acre in northern Aroostook, \$44 per acre on the potato farms outside of Aroostook, and \$45 per acre in central Aroostook.

Mechanical Potato Loader. Mechanical potato-loading equipment adapted to loading potatoes on trucks in the field is one of the more important devices introduced to meet the shortage of labor. These machines were initiated largely by the farmers themselves. Although it is not known how many machines of this nature were in use in 1944, it is known that the number is large and that it has been on the increase.

These loaders or hoists are of two main types, (1) the lever hoist and (2) the cable hoist. In the case of the lever hoist, a hydraulic cylinder operated by a pump lifts a horizontal arm to the end of which is attached a barrel clamp. The cable hoist employs a rope or cable running through a pulley at the end of a horizontal arm and winding on a drum. Power is furnished variously from the motor of the truck, from the truck transmission, from a gasoline engine mounted on the truck, or from an electric storage battery mounted on the truck.

More of the hydraulic type of hoist were observed than of the cable type. The farmers' estimates of the cost of the hoist varied from \$175 to \$225. Several local companies are now manufacturing mechanical potato-loading equipment.

Production Cost. The average cost of growing and harvesting potatoes on these farms in 1944, computed on the basis that the cost of labor, seed, and fertilizer constitutes two thirds of the growing and harvesting cost, was \$207 per acre. The total production cost including the farmers' cost of storing and selling was \$271 per acre. The per-barrel cost of growing and harvesting was \$2.13. The production cost per barrel including the farmers' cost of storing and selling was \$2.79. The cost of production in 1944 was 54 per cent higher than the average of the five years, 1926-1930.

Quality of Inspected Potatoes, 1942 and 1943. The defects recorded for the 25,000 to 35,000 carlots of Maine potatoes inspected annually by the Federal-State Inspection Service indicate the quality of the crop produced.

Potatoes to pass inspection as U. S. No. 1 grade must be free from grade defects except for tolerance allowances. The definition of U. S. No. 1 grade and the tolerance for defects taken from "United States Standards for Potatoes" issued by the U. S. Department of Agriculture, June 1, 1942, is as follows:

"U. S. No. 1 shall consist of potatoes of one variety or similar varietal characteristics which are fairly well shaped, free from freezing injury, blackheart, blight, and soft rot or wet breakdown, and from damage caused by dirt or other foreign matter, sunburn, second growth, growth cracks, air cracks, hollow heart, internal discoloration, cuts, shriveling, sprouting, scab, dry rot, rhizoctonia, other disease, wireworm, other insects or mechanical or other means.

"Tolerance for defects.—In order to allow for variations other than size incident to proper grading and handling, not more than 6 per cent of the potatoes in any container may be below the requirements of the grade but not to exceed one-sixth of this amount, or 1 per cent, shall be allowed for potatoes affected by soft rot or wet breakdown. In addition, not more than 5 per cent may be damaged by hollow heart and internal discoloration."

In the potatoes inspected in 1942 and 1943, there were 25 different causes for grade defects recorded. However, 6 of these accounted for two thirds of the damage. Analysis of the 10 per cent sample of the potatoes inspected shows that there was a larger percentage of both external and internal grade defects in 1943 than in 1942. Potatoes out of grade because of external defects in 1942 averaged 3.08 per cent compared with 3.97 per cent in 1943. Comparable figures for internal defects were 1.06 per cent in 1942 and 1.51 per cent in 1943.

Bruises and cuts constituted the chief grade defect in 1942 but in 1943 sunburn caused more grade damage than bruises and cuts. Bruises and cuts in 1942 caused 1.48 per cent of grade defects compared with 1.38 per cent in 1943. Grade defects caused by sunburn in 1942 amounted to 0.68 per cent compared with 1.52 per cent in 1943.

Net necrosis caused 0.99 per cent of grade defects in 1942 and 0.34 per cent in 1943. At the same time, grade defects caused by hollow heart amounted to 0.01 per cent in 1942 and 1.14 per cent in 1943.

Scab and ring rot were each more important in 1942 than in 1943. Late blight infection, on the other hand, was more important in 1943 than in 1942. In 1942 scab caused 0.38 per cent of grade defects compared with 0.13 per cent in 1943. Comparable figures for ring rot were 0.18 per cent in 1942 and 0.07 per cent in 1943. Grade defects caused by late blight infection amounted to 0.06 per cent in 1942 and 0.31 per cent in 1943.

External grade defects in 1942 averaged lowest (2.88 per cent of the potatoes inspected) in the central Aroostook area and highest (4.39 per cent) at inspection points outside of Aroostook. The average of external damage in both northern and southern Aroostook was 3.47 per cent in 1942. In 1943 the percentage of external grade defects in each of the areas was larger than in 1942 but distribution between the areas was similar to that of 1942.

The total percentage of internal defects in 1942 ranged from 0.46 per cent in southern Aroostook to 1.77 per cent for the inspection points outside of Aroostook. In 1943 the percentage range of total internal defects was from 0.88 per cent in northern Aroostook to 3.43 per cent for the inspection points outside of Aroostook. In each of the areas the percentage of internal defects was higher in 1943 than in 1942.

RECENT PUBLICATIONS OF INTEREST TO POTATO GROWERS

BULLETINS

- No. 427. Early Harvesting of Healthy Seed Potatoes for the Control of Potato Diseases in Maine.
- No. 432. Costs and Practices in Producing Potatoes in Southern Aroostook County, Maine, 1941.
- No. 434. Treatment of Potato Refuse Piles to Prevent Spread of Late Blight.

MISCELLANEOUS PUBLICATIONS

- No. 603. Storage of the 1945 Maine Potato Crop.

ABSTRACTS OF ARTICLES PUBLISHED IN PERIODICALS

TEMPERATURE INHIBITION OF STORAGE DEVELOPMENT OF NET NECROSIS AND "STEM-END BROWNING" OF MAINE POTATOES OF THE GREEN MOUNTAIN VARIETY¹⁵

In northeastern Maine where Green Mountain potatoes are harvested as soon as possible after maturity, net necrosis (from

¹⁵ This is an abstract of a paper by Donald Folsom having the same title and published in *Phytopathology*, Vol. 34, No. 12, page 999. 1944.

current-season leafroll infection) and "stem-end browning" (cause undetermined) normally develop only in storage. Their development is maximum and most rapid at about 45° to 50° F., at which temperature the peak usually is reached in 60 to 90 days, and is not influenced by relative humidity. The optimum and maximum temperatures are somewhat higher for stem-end browning than for net necrosis. Development does not occur or is greatly reduced, even at optimum temperatures, if the storage temperature is first held for 60 days at 70° F., which is above the temperature range, or for 30 to 60 days at 32° to 36° F., which is near the lower end of the temperature range. This effect decreases progressively with shorter periods of exposure to the extreme temperatures and as the temperatures approach optimum for necrosis.

POTATO RESISTANCE TO LEAFROLL¹⁶

In southwestern Maine, with leafroll plants of a commercial variety always in adjacent rows, 70 to 90 per cent of 8,586 seedlings tested in the six years from 1938 to 1943 acquired the disease in one year, as evidenced by symptoms appearing the following year. Similarly exposed healthy plants of the Chippewa and Green Mountain varieties had respectively, 85 and 50 per cent leafroll on the average per year. Among the 5,518 seedlings introduced from 1938 to 1941 inclusive, only 21 are left, most of which are from the cross Imperia x Earlane. These 21 have remained practically free of leafroll. Leafroll infection has been the basis for elimination of most of the others. When several of these apparently resistant seedlings were crossed with good commercial varieties, the resulting seedlings generally were more vigorous than the resistant parent, and considering all crosses for which they were used, only 55 per cent of these contracted leafroll in the first year of exposure. It seems possible to produce commercially valuable new seedlings resistant enough to leafroll to avoid severe field spread of the disease.

¹⁶ This is an abstract of a paper by Donald Folsom and F. J. Stevenson having the same title and published in *Phytopathology*, Vol. 34, No. 12, pages 999-1000. 1944.

THE CONTROL OF POTATO LATE-BLIGHT TUBER ROT¹⁷.

When the late-blight disease is present on potato vines, the late-blight fungus produces spores that may be washed by rain into the soil where they start late-blight rot of the tubers. However, there is generally less danger from this process in Aroostook County than from the spores lodging on the tubers when dug and causing late-blight rot in storage. In 1944 about a tenth of the Aroostook crop rotted in storage because of late-blight rot. In the crop from a field where some late blight was present late in the season, late-blight storage rot took 53 per cent of the tubers dug while the foliage was still mostly green, but only 6 per cent of the tubers dug after the foliage had been killed by frost. Such premature digging had increased late-blight storage rot from none to 20 per cent of the crop in 1942, and from 4 per cent of the crop to 48 per cent in 1943. The necessity of detecting late blight on the foliage late in the season, and of waiting for a killing frost if late blight is present, can be avoided by killing the tops with herbicides (chemical weed killers) about ten days before digging is to be started. Such artificial killing of the tops was followed by no more late-blight storage rot than frost-killing.

¹⁷ This is an abstract of a paper by Reiner Bonde and E. S. Schultz having the same title and published in *The American Potato Journal*, Vol. 22, pages 163-167, 1945.

APPENDIX

TABLE 1

Ring Rot Occurring after Treating Contaminated Seed Pieces in Solutions of Puratized N5-X for Different Periods of Time and Different Concentrations^{1 2}—1944

Experiment	Treatment	Concentration of solution	Time of treatment	Ring rot developing	Stand	Plant growth
			Minutes	% ³	% ³	
1	Inoculated seed pieces treated by dipping in Puratized N5-X solution	1-4310 (2 cc — 1000 cc)	5	42±1.50	78±3.09	Normal
2	do.	1-8320 (1 cc — 1000 cc)	5	68±3.98	82±2.79	do.
3	do.	1-17240 (1 cc — 2000 cc)	5	68±2.80	87±3.33	do.
4	do.	1-4310 (2 cc — 1000 cc)	30	23±3.28	63±3.15	Weak and normal
5	do.	1-8320 (1 cc — 1000 cc)	30	49±2.06	82±3.45	do.
6	do.	1-17240 (1 cc — 2000 cc)	30	58±4.41	83±3.42	Normal
7	do.	1-4310 (2 cc — 1000 cc)	90	14±5.20	42±6.15	Very weak
8	do.	1-8320 (1 cc — 1000 cc)	90	34±6.28	52±4.08	do.
9	do.	1-17240 (1 cc — 2000 cc)	90	45±1.20	72±3.63	Normal
10	Inoculated seed pieces dipped in water	Check No Treatment	5	74±2.21	88±2.73	do.
11	do.	do.	30	78±4.45	79±3.06	do.
12	do.	do.	90	80±3.40	82±3.60	do.
13	Control not dipped in water	do.	—	88±3.31	92±1.08	do.

¹ Supplied by Puratized, Inc., 250 East 43rd Street, New York, N. Y., and said to contain 11.6 per cent toxicant.

² Seed pieces contaminated by being dipped in a heavy suspension of the bacteria in water.

³ Based on five replicated plots of 25 seed pieces for each treatment.

TABLE 2

*Ring Rot Occurring after Treating Contaminated Potato Bags with
Different Disinfectants—1944*

Disinfectants ¹	Concentration of disinfectant	Ring rot developing from inoculating seed pieces with treated sacks		
		Cut surfaces of seed pieces rubbed ²	Eyes seed pieces pricked ³	Control. Sacks not treated
		Per cent ⁴	Per cent ⁴	Per cent ⁴
Copper sulphate	1 pound in 10 gallons water	2	4	100
do.	2 pounds in 10 gallons water	0	2	100
do.	4 pounds in 10 gallons water	0	0	100
do.	6 pounds in 10 gallons water	0	0	100
Copper sulphate and saturated salt solution	2 pounds copper sulphate in 10 gallons water saturated with table salt	0	0	80
Coal Tar Dip	1 gallon in 100	0	0	60
Phenol Coefficient 6	2 gallons in 100	0	0	70
	4 gallons in 100	0	2	80
Formaldehyde	1 pint in 40 gallons	0	4	70
do.	2 pints in 40 gallons	0	0	70
do.	3 pints in 40 gallons	0	0	
do.	4 pints in 40 gallons	0	0	
Table salt	4 pounds in 10 gallons water	2	6	70
do.	8 pounds in 10 gallons water	2	4	80
do.	16 pounds in 10 gallons water	4	4	100
Corrosive sublimate	4 ounces in 30 gallons water	0	0	100

¹ Pieces of burlap potato bags were severely contaminated with the ring-rot organism taken directly from infected potatoes. The pieces of bags were soaked for 5-minute periods in the different disinfecting solutions before being used to inoculate freshly cut potato seed pieces.

² Freshly cut surfaces of potato seed pieces were rubbed with the pieces of treated bags and then planted in the greenhouse.

³ The treated pieces of contaminated bags were moistened with water, the excessive water was squeezed from the bags, and a drop pricked into the eyes of the seed pieces with sterilized needles.

⁴ Based on reading from 50 inoculated seed pieces planted in the greenhouse.

TABLE 3

Ring Rot Resulting from Inoculating Freshly Cut Seed Pieces with Pieces of Contaminated Burlap Bags Stored at Different Temperatures for Different Periods of Time¹

Storage condition of pieces of sack	Percentage ring-rot plants resulting from inoculations		
	After 115 days ²	After 334 days ³	After 483 days ⁴
	Per cent	Per cent	Per cent
Outside ⁵	22	12	4
30° F. ⁶	100	48	12
32° F. ⁶	44	38	20
36° F. ⁶	72	0	0

¹ Burlap potato bags were cut into 12-inch square pieces and contaminated by being smeared with decay from infected tubers. They were placed at the different storage conditions February 18, 1943 and were used for inoculating the seed pieces June 12, 1943 (after 3 months and 25 days), January 18, 1944 (after 11 months and 4 days) and on June 15, 1944 (after 1 year, 3 months and 28 days).

² Percentage infection based on disease reading from 50 inoculated seed pieces planted in the field.

³ Percentage infection based on disease reading from 250 inoculated seed pieces planted in the greenhouse.

⁴ Percentage infection based on disease reading from 100 inoculated seed pieces planted in the field.

⁵ Contaminated pieces of sack fastened to wall on north side of barn.

⁶ Controlled temperature chambers at Aroostook Farm, Presque Isle, Me.

TABLE 4

Ring Rot Resulting from Inoculating Freshly Cut Seed Pieces with Pieces of Contaminated Potato Bags Stored for 11 Months at 32° F.¹

Sack No.	Method of inoculation	
	Cut surfaces of seed pieces rubbed ²	Eyes of seed pieces pricked ³
	Per cent ⁴	Per cent ⁴
31	50	90
32	50	90
33	40	100
34	50	80
35	0	70

¹ Pieces of burlap bags were contaminated by smearing with infected potato tissue and placed in controlled temperature storage bins February 18, 1943 until January 18, 1944.

² Freshly cut surfaces of the seed pieces were inoculated by being rubbed with the contaminated pieces of bags.

³ The pieces of contaminated burlap bags were moistened with water. The excessive water was squeezed from the bag and a drop pricked into eyes of the seed pieces with sterilized needles.

⁴ Based on 50 inoculated seed pieces for each treatment.

TABLE 5

Comparison of Ring Rot Resistance in Different Commercial and Seedling Varieties—1944¹

Variety	Ring rot occurring		Severity of decay in tubers
	Plants	Tubers	
	Per cent ²	Per cent ³	
Green Mountain	95	95.0	Severe and tubers badly disintegrated
Katahdin	72	68.2	Severe. Many tubers, however, intact and firm
Sebago	51	45.3	do.
President	2 ⁴	14.8	Very slight
S. 47102	18 ⁴	15.2	Very slight
S. 46952	2 ⁴	31.8	Slight. More severe than for President and 47102
S. 870 ⁵	1 ⁴	0.0	None
S. 824 ⁶	4 ⁴	0.0	None

¹ The freshly cut surfaces of seed pieces were inoculated by being dipped in a heavy water suspension of the bacteria. Planted immediately in the field.

² Percentages based on 10 replicated lots of 10 seed pieces each for the different varieties.

³ Infection found on cutting and examining the tubers harvested from the inoculated plants after they had been in storage for five months.

⁴ Symptoms not definitely ring rot but plants suspected as having the disease.

⁵ Resistant seedling selected in 1942 and tested again in 1943 and 1944. Parentage Earline x 336-144.

⁶ Resistant seedling selected in 1942 and tested again in 1943 and 1944. Parentage Houma x 336-144.

TABLE 6

Ring Rot Resistant Seedlings in Different Progenies Inoculated in the Field in 1944. Ring Rot in Controls and Parents of Progenies Included for Comparison¹

Variety or Cross	U.S.D.A. Pedigree No.	Number seedlings tested	Number controls and parent lots tested	Resistant seedlings or lots	
				Number ²	Percentage
Katahdin controls			109	0	0
Sebago			5	0	0
46952			5	5	100.0
Green Mountain			5	0	0
Houma			5	0	0
Earlaine			5	0	0
Earlaine #2			5	0	0
47156			5	0	0
96-44			5	2	40.0
96-50			5	0	0
96-28			5	0	0
336-144			5	5	100.0
President			100	100	100.0
96-28 x 336-144	B-345	20		8	40.0
96-44 x 336-144	B-351	77		41	51.2
96-56 x 336-144	B-355	62		22	35.5
President x 96-28	B-273	117		43	36.8
President x 47156	B-274	108		60	55.6
President x Katahdin	B-275	103		34	33.0
Earlaine x 336-144	B-319	57		21	36.8
Green Mountain x 336-144	B-282	84		29	46.1
Houma x 336-144	B-296	67		33	49.3
Sebago x 46952	B-311	53		3	5.7
Earlaine x 46952	B-320	49		27	55.1
Earlaine #2 x 46952	B-327	9		1	11.1
46952 x Katahdin	B-433	5		2	40.0
46952 x 336-144	B-434	92		49	53.3
336-144 Selfed	B-1080	23		19	82.6
46952 Selfed	B-1081	14		10	71.4
President Selfed	B-1103	127		69	54.4

¹ Five seed pieces of each seedling inoculated by being dipped in a heavy suspension of the bacteria and planted immediately in the field.

² Showed no ring rot symptoms in foliage or in tubers at time of harvest.

TABLE 7

Comparison of the Prevalence of Potato Ring Rot in One Town for the Years 1941, 1943, and 1944¹

	1941	1943	1944
Number of farms visited	146	103	62
Number of farms visited having ring rot	98	42	19
Per cent of farms visited having ring rot	67.1	40.8	30.7
Number of fields visited	463	172	80
Number of fields visited having ring rot	164	51	19
Per cent of fields visited having ring rot	35.4	29.7	23.7
Total number of acres inspected	5338.5	2486	1513
Number of acres, in fields inspected, having ring rot	1843.1	676	278
Per cent of total acreage, in fields inspected, having ring rot	40.9	27.2	17.9

¹ The data from which this summary is derived were secured by examination of the fields during the time the crop was being harvested.

TABLE 8

Prevalence of Ring Rot in the Different Varieties of Potatoes in One Town During the Years 1941, 1943, 1944

Variety	Total acres examined		Acres in fields with ring rot		Per cent of total acreage in fields with ring rot		
	1943	1944	1943	1944	1941	1943	1944
Katahdin	1027.0	410.0	336.0	54.0	33.9	32.7	13.2
Chippewa	529.7	532.0	156.0	164.0	58.8	29.5	32.7
Green Mountain	473.5	483.0	135.0	55.0	30.5	32.7	11.5
Irish Cobbler	282.0	101.0	10.0	00.0	17.1	3.5	0.0
Sebago	137.0	5.0	0.0	0.0	14.7	0.0	0.0
Houma	32.0	15.0	5.0	5.0	0.0	15.6	33.3
Spaulding Rose	4.0	0.0	0.0	0.0	0.0	0.0	—
Totals	2485.8	1513.0	662.0	278.0			

TABLE 9

Amount of Ring Rot in One Town During the Years 1943 and 1944

Tubers infected	Acres in infected fields					
	Number acres	Per cent of total acreage examined	Per cent of infected acreage examined	Number acres	Per cent of total acreage examined	Per cent of infected acreage examined
	1943			1944		
Trace	456.0	18.3	67.5	207	13.7	74.5
0.1 to 0.9%	54.0	2.2	8.0	9	0.6	3.2
1.0 to 5.0%	143.5	5.8	21.2	27	1.8	9.7
6.0 to 9.0%	0.0	0.0	0.0	35	2.3	12.6
10.0 to 25.0%	22.0	0.9	3.3	0	0.0	0.0
26% and over	1.3	trace	0.01	0	0.0	0.0
Total infected	676.0	27.2	100.0	278	18.4	100.0
Total not infected	1810.0	72.8	0.0	1235	81.6	0.0
Total examined	2486.0	100.0	—	1513	100.0	—

TABLE 10

*Source of Potato Seed Used in Fields Showing Ring Rot
in One Town*

Seed source Grower No.	Number of fields infected	Acreage	Per cent of total acreage
1	4	71	25.54
2	2	15	5.39
3	2	37	13.31
4	1	35	55.76
5	1	30	
6	1	22	
7	1	18	
8	1	14	
9	1	10	
10	1	6	
11	1	5	
12	1	5	
13	1	5	
14	1	5	
Totals	19	278	100.00

TABLE 11

*Control Practices in Relation to Ring-Rot Infection Among Seed Plot
Growers of the Farm Security Administration Program in the Vicinity
of Frenchville and Caribou, Maine*

Area	Number growers	Planted seed plot first	Dug seed plot first	Disinfected or new:			
				Planter	Barrels	Bin	Digger
Caribou	20	9	8	11	5	4	5
Frenchville	14	9	9	4	10	4	4
Totals	34	18	17	15	15	8	9

TABLE 12

*Summary of Ring Rot Survey of Farm Security Administration
Seed Plots Located Near Caribou and Frenchville*

Number growers	Area	Seed Plot		Commercial field	
		Ring rot	Free of Ring rot	Ring rot	Free of Ring rot
20	Caribou Frenchville	3	17	14	6
14		4	10	13	1
34		7	27	27	7

TABLE 13

*Comparison of Highmoor Farm Leafroll-Resistant Potato Seedlings
on Aroostook Farm 1944*

Variety or seedling	Plots	Stems per hill	Oz. per tuber	Lbs. per hill	Bbls. per acre ¹	Bu. per acre ¹	Predominant tuber type ²
Green Mt.	11	3.7	3.23	1.43	126	346	4
X750-10M ³	10	3.7	2.03	1.14	100	275	1, thin
X750-10 ⁴	10	2.8	2.08	1.58	89	244	1
X1276-48 ⁵	10	1.9	2.62	.81	66	180	1, 4
X1276-185	5	3.7	2.69	1.11	97	266 ⁶	4
X247-24	10	1.8	2.61	.52	45	123	4
X247-30 ⁷	1	2.9	1.88 ⁸	.77	62	171	Most poor; some spindle tuber
X247-42	1	4.0	1.52 ⁹	.83	73	202	Flat, round, thin
X247-48 ⁹	5	2.1	2.78	.68	46	125	4
B24-9	1	5.0	1.59	1.08	95	262 ¹⁰	6
B24-50 ¹⁰	10	1.7	3.55	.62	51	141	1
B24-58	10	5.1	2.04	1.26	110	304	1, 4, 5
B24-76 ¹¹	10	3.6	1.78	1.10	95	262 ¹⁰	1
B24-78	5	5.8	1.77	1.29	110	304	4, 5, 6
B24-91	1	5.0	1.54 ⁸	1.08	95	262 ¹⁰	Like Irish Cobbler
B24-156	1	4.7	1.78 ⁸	.79	70	192 ¹⁰	Like I.C. but thinner
B24-174	1	5.5	1.50 ⁸	1.09	88	242 ¹⁰	Like Irish Cobbler
B24-190.	1	3.4	1.70 ⁸	.96	84	232 ¹⁰	Like I.C. to Chippewa
B24-238	10	3.2	2.00	1.11	97	266	1
B24-304	1	3.8	1.31 ⁸	.71	62	171 ¹⁰	Like Irish Cobbler

¹ Chippewas yielded 82% as much as Green Mountains elsewhere on Aroostook Farm, which would be equivalent to 103 barrels or 284 bushels an acre here.

² Number of tuber type same as in Fig. 17 of Me. Agr. Exp. Sta. Bul. 358.

³ Early harvested; free of latent mosaic.

⁴ 4 per cent leafroll.

⁵ (X1276-48) with some weak hills, which had Rhizoctonia desprouting.

⁶ Dead or nearly so first part of September

⁷ (X247-30), mostly spindle-tuber.

⁸ With no tubers weighing as much as 6 oz.

⁹ (X247-48) with weak hills, which had seed-piece rot.

¹⁰ (B24-50) mostly spindle-tuber.

¹¹ (B24-76) 1 per cent leafroll.

TABLE 14

*Correlations Between Characteristics of Series of
Seedlings of Table 13*

Comparison	r	Significant? ¹
Stems per hill and tubers per hill	+ .873	Highly
Stems per hill and average tuber weight	-.647	Highly
Stems per hill and weight of hill	+ .669	Highly
Tubers per hill and average tuber weight	-.789	Highly
Tubers per hill and weight of hill	+ .739	Highly
Weight of hill and number of plants per plot	+ .460	Yes
Weight of hill and yield rate per acre	+ .992	Highly
Weight of hill and average tuber weight	-.186	No
Number of plants per plot and yield rate per acre	+ .559	Highly
Number of plants per plot and tubers per hill	+ .405	No
Average tuber weight and yield rate per acre	-.185	No

¹ According to tables in No. 4 of Vol. 30 of Iowa State College of Agriculture and Mechanic Arts Official Publication. (Wallace, H. A., and George W. Snedecor, Correlation and machine calculation, revised by G.W.S. 1931.)

TABLE 15

Leafroll Reaction of New Seedlings

Pedigree No.	Tubers planted	Hills growing	Hills showing leafroll symptoms resulting from current season infection	Hills saved for further testing
B507	238	233	194	39
B511	133	110	85	24
B512	206	193	143	50
B517	284	271	206	65
B518	164	154	116	38
B522	370	352	224	128
B1113	527	471	60	411

TABLE 16

Stem-end Browning and Net Necrosis in Tubers from Permanent Plots, Aroostook Farm, 1944

Stored at least 3 months at 50° before cutting. Per cent S.E.B. calculated on basis of Net Necrosis-Free Tubers*

Plot No.	Fertilizer Treatment 2000# per acre unless otherwise stated	Tubers with Net Necrosis	Per cent of tubers free of NN having S.E.B.		
			Severe ¹		Total S.E.B
			Av.	Range ²	
Rate of application					
211	No fertilizer	16.2	0	—	1.0
237	1500 lbs.	17.0	6.5	2-16	18.2
231	2000 lbs.	35.3	5.3	3-8	26.3
245	2500 lbs.	42.2	8.2	2-19	24.4
257	3000 lbs.	35.1	11.3	7-17	24.2
Fertilizer Ratios					
213	0-8-8	18.3	7.6	2-15	16.2
223	2-8-8	23.1	10.4	3-18	31.0
231	4-8-8	35.3	5.3	3-8	26.3
223	6-8-8	27.7	5.2	0-10	22.2
214	4-0-8	18.6	4.1	1-6	15.3
244	4-4-8	22.0	6.0	1-22	25.4
231	4-8-8	35.3	5.3	3-8	26.3
234	4-12-8	42.1	8.3	4-13	31.6
215	4-8-0	19.4	.4	0-1	1.9
225	4-8-4	25.3	1.2	0-2	7.3
231	4-8-8	35.3	5.3	3-8	26.3
216	4-8-10	36.2	11.1	1-25	33.4
235	4-8-12	34.7	17.2	11-34	39.1
Muriate versus Sulfate of Potash					
227	KCl unlimed ½	25.3	7.1	4-10	22.9
	KCl limed ½	22.6	10.9	4-20	31.7
	Average	24.0	9.0		27.3
217	K ₂ SO ₄ unlimed ½	18.2	4.0	2-9	14.1
217	K ₂ SO ₄ limed ½	21.8	2.2	0-7	19.3
	Average	20.0	3.1		16.7

* On basis of 800 to 1200 tubers per plot. One-bushel samples from each of 6 rows averaged together. Rows 1, 2, and 3 planted with strain of Green Mountain less susceptible to S.E.B. development. Rows 4, 5, and 6 planted with susceptible strain. All 6 rows averaged together in this table.

¹ Severe stem-end browning—discoloration ¼" deep or deeper—of economic importance.

² Range—lowest and highest percentage in six boxes.

TABLE 17

Effect of Fertilizer Treatment on Stem-end Browning and Net Necrosis in Tubers Grown on Soil Which Had Not Been Previously Fertilized

Treatment No.	Fertilizer Treatment	Acre Yield	Net Necrosis	Stem-end Browning based on net-free tubers	
				Severe	Total
		Bu.	%	%	%
1	2500# 4-8-8 equivalent of Urea, NH_4PO_4 and KNO_3	286	33	6	20
2	Same as No. 1 plus 10# borax	238	32	5	22
3	Same as No. 1 plus 500# salt (NaCl)	285	39	16	40
4	Same as No. 3 plus 10# borax	309	39	14	34
5	2500# 4-8-8 with KCl as source of potash	282	41	12	27
6	3500# 4-8-8 with KCl as source of potash	291	34	8	20
7	2500# 4-8-8 with K_2SO_4 as source of potash	315	38	7	22
8	3500# 4-8-8 with K_2SO_4 as source of potash	338	38	8	36
9	No. 7 with NaCl equivalent to Cl in No. 5	301	45	15	28
10	No. 8 with NaCl equivalent to Cl in No. 6	282	40	13	32
11	No. 6 plus 50# copper sulfate	290	32	11	26
12	2500# 4-8-0	255	35	4	13
13	No fertilizer	88	25	4	22

Yield data based on five replicated plots of each treatment.
S.E.B. and N.N. data based on three bushel box samples.

TABLE 18

Effect of Borax Glass in Potato Fertilizers on Yield and on Development of Net Necrosis and Stem-end Browning

Amount and kind of fertilizer	Amount and Source of boron	Acre yield		Net ¹ Necrosis	Stem-end Browning based on net-free tubers	
					Sev. ² SEB	Total SEB
		Bu.	Bbl.	%	%	%
2000 pounds 5-7-10 with K_2SO_4 as source of potash	None	371	135	24	45	80
	75# borax glass 702 AP	175	64	25	5	59
	150# borax glass 702 AP	128	47	31	8	54
	75# borax glass 702 AQ 80 mesh	234	85	20	8	62
	150# borax glass 702 AQ 80 mesh	171	62	18	11	56

¹ Net necrosis and stem-end browning readings based on examination of sample of 200 to 300 tubers which had been stored for three months at 50° F.

² Severe stem-end browning refers to a discoloration that extended $\frac{1}{4}$ or more inches into the tuber.

TABLE 19

Effect of Boron in Potato Fertilizers on Yield and on Development of Net Necrosis and Stem-end Browning

Amount and kind of fertilizer	Amount and Source of boron	Acre yield		Net ¹ Necrosis	Stem-end Browning based on net-free tubers	
		Bu.	Bbl.		Sev. ² SEB	Total SEB
2000 pounds 5-7-10 KCl as source of potash	None	350	129	33	6	47
	10# borax	317	115	32	6	36
	25# borax	279	101	21	7	37
	75# Spent boron Catalyst	296	108	28	6	40
	150# Spent boron Catalyst	271	98	32	6	32
2000 pounds 5-7-10 K ₂ SO ₄ as source of potash	None	367	133	18	2	21
	10# borax	318	116	25	2	27
	25# borax	275	100	35	12	36
	75# Spent boron Catalyst	298	108	27	9	31
	150# Spent boron Catalyst	243	88	17	3	25

¹ Net necrosis and stem-end browning readings based on examination of samples of about 400 tubers which had been stored for three months at 50° F.

² Severe stem-end browning refers to a discoloration that extended $\frac{1}{4}$ or more inches into the tuber.

TABLE 20

*Effect of Date of Planting on Net Necrosis
Aroostook Farm, 1944*

Green Mountains

Seed	Date planted	Net necrosis at different digging dates ³			
		August 26 ⁴	September 9 ⁵	October 7 ⁶	All
		%	%	%	%
Keswick ¹	May 16	0.5	2.5	9.4	3.8
	May 31	12.0	27.9	25.6	21.8
	June 15	24.3	38.7	18.9	27.8
Minnesota ²	May 16	0.3	7.7	7.0	4.9
	May 31	5.1	16.3	18.7	13.6
	June 15	9.2	30.4	18.1	19.2

¹ Highly susceptible to stem-end browning.

² Fairly resistant to stem-end browning.

³ Tubers stored immediately at 50° F. and examined after 100 or more days at this temperature. Except for the last column, all figures are the averages of 3 replicates, each 32 feet long. For yields, see Table 25.

⁴ Tops pulled August 23.

⁵ Tops pulled September 9.

⁶ Tops killed by freeze on September 24.

TABLE 23

*Susceptibility of Green Mountains Obtained from Various
Foundation Growers to Stem-end Browning
Aroostook Farm, 1944*

Plot No.	Lot No.	Strain	Stem-end browning ⁴	
			Severe	Total
			%	%
1	1	Keswick	23.9	36.3
	2	Unknown	13.7	21.5
	3	Highmoor	4.1	6.4
	4	Highmoor	6.7	7.4
	5	Vermont	7.7	9.7
	6	Unknown ¹	6.2	8.7
2	1	Keswick	20.6	30.9
	7	Keswick(?) ²	14.6	25.7
	8	Vermont	5.4	7.5
	9	Phillips	5.7	8.5
	10	Phillips	4.1	5.6
	6	Unknown ¹	4.5	6.1
3	1	Keswick	45.1	52.9
	11	Keswick	36.9	49.4
	12	Unknown ³	21.8	27.5
	6	Unknown ¹	9.4	15.4

¹ Lot No. 6 was obtained from Minnesota and was included in all plots as a typical resistant strain.

² Origin not certain, but is probably Keswick strain.

³ Previous experience with this lot indicated that it was a mixture of strains.

⁴ The figures for plots 1 and 2 are the averages of 6 replicates, each 29 feet long, from a 6 x 6 Latin Square. Those for plot 3 are the averages of 5 replicates, each 29 feet long.

TABLE 24
Effect of Date of Planting on Stem-End Browning and on Yield
Aroostook Farm, 1944

Green Mountains

Seed	Date planted	Yield at different digging dates ¹ .						Stem-end browning at different ² & digging dates					
		August 29 ³			September 9 ⁴			October 7 ⁵			August 28 ⁶		
		Bbl./A.	Bu./A.	Bbl./A.	Bu./A.	Bbl./A.	Bu./A.	Bbl./A.	Bu./A.	%	%	%	%
Keweenaw ¹	May 16	81.0	222.8	105.3	289.6	118.9	327.0	15.1	13.1	32.7	19.4		
	May 31	58.7	161.4	88.3	242.8	96.6	265.7	27.6	26.0	50.3	34.4		
	June 15	27.7	76.1	62.6	172.2	74.3	204.3	38.5	33.1	46.5	35.2		
Minnesota ²	May 16	80.0	220.0	112.1	308.3	140.2	385.6	7.4	4.7	9.7	7.3		
	May 31	50.2	138.1	95.6	262.9	101.4	279.9	26.9	16.8	19.5	20.8		
	June 15	43.2	118.8	57.7	158.7	70.9	195.0	25.3	17.3	28.8	30.7		

¹ Highly susceptible to stem-end browning.

² Fairly resistant to stem-end browning.

³ Figures in all except the last column are the averages of 3 replicates, each 32 feet long.

⁴ Tubers were stored immediately at 50° F. and examined after storage for 100 or more days at that temperature.

⁵ Tops pulled August 28.

⁶ Tops pulled September 9.

⁷ Killing freeze on September 24.

TABLE 25

Effect of Adding Calomel to the Fertilizer

Keswick Green Mountains

Digging Date	Treatment ⁴	Net necrosis ⁵	Stem-end browning ⁵	
			Severe	Total
		%	%	%
August 26 ¹	1600# 6-9-15/A.	1.8	25.9	34.1
	1600# 6-9-15/A. plus 5# HgCl	2.3	14.5	23.2
September 9 ²	1600# 6-9-15/A.	7.2	11.2	19.4
	1600# 6-9-15/A. plus 5# HgCl	9.6	5.3	10.8
September 27 ³	1600# 6-9-15/A.	13.0	6.8	11.8
	1600# 6-9-15/A. plus 5# HgCl	18.0	7.6	13.7

¹ Tops pulled August 23.² Tops pulled September 9.³ Killing frost September 24.⁴ Band placement. Calomel was mixed with the fertilizer before application.⁵ Averages of 6 replicates, each 29 feet long, from a 6 x 6 Latin Square. Tubers examined after storage for 100 or more days at 50° F.

TABLE 26

Effect of Adding Varying Amounts of Calomel to the Fertilizer on Yield, Net Necrosis and Stem-end Browning

Green Mountain

Seed	Pounds of calomel per acre ³	Pounds of mercury per acre	Yield ⁴		Net necrosis ⁴	Stem-end browning ⁴	
			Bbl./A.	Bu./A.		Severe	Total
					%	%	%
Minnesota ¹	0	0	123.0	338	30.8	12.3	17.4
	5	4.25	114.7	315	34.5	6.8	10.1
	10	8.50	116.6	321	32.5	2.8	5.7
	15	12.75	108.9	300	27.5	3.9	6.1
	25	21.25	105.4	290	27.6	2.8	5.9
Keswick ²	0	0	126.9	349	30.1	33.1	46.9
	5	4.25	124.0	341	35.8	21.3	34.4
	10	8.50	122.1	336	36.7	24.1	39.2
	15	12.75	120.8	332	38.0	19.9	36.8
	25	21.25	124.3	342	32.7	15.4	34.8

¹ Fairly resistant to stem-end browning.² Highly susceptible to stem-end browning.³ The calomel was mixed well with a 6-9-15 commercial fertilizer applied in bands in the usual manner. The mixture was applied at a rate equivalent to 1600 pounds per acre of the 6-9-15 fertilizer. Band placement.⁴ The figures in these columns are the averages of 5 replicates, each 29 feet long, from a double-row 5 x 5 Latin Square. The tubers were examined for net necrosis and stem-end browning after storage for 100 days or longer at 50° F.

TABLE 27

*Transmission of Susceptibility to Stem-end Browning by Tuber Grafts
Aroostook Farm, 1943-1944*

Green Mountains

1943 seed	Plot 1 ²				Plot 2 ³			
	1943 crop		1944 crop ⁴		1943 crop		1944 crop ⁴	
	No. tubers	Stem-end browning ⁵	No. tubers	Stem-end browning ⁵	No. tubers	Stem-end browning ⁵	No. tubers	Stem-end browning ⁵
		%		%		%		%
Minnesota (not grafted)	48	6.3	373	9.4	287	2.3	733	13.8
Plug of Keswick grafted into Minnesota seed piece ¹	42	28.6	362	29.8	329	15.2	731	21.1
Keswick (not grafted)	22	22.7	388	36.6	235	26.7	740	39.3

¹ Care was taken to use plugs without eyes.

² In 1943 the tuber units from this plot were kept separate. About 50% of the grafted units produced more stem-end browning than the corresponding Minnesota controls. Only those thus showing an indication of transmission are here reported as the 1943 crop. The same units were the only ones replanted in 1944.

³ Tuber units were not kept separate; the figures shown are plot averages.

⁴ The 1943 crop was used for seed in 1944.

⁵ Tubers were examined after storage for 100 or more days at 50° F.

TABLE 28

Minor Elements Added to the Fertilizer in Relation to Yield, Stem-end Browning and Net Necrosis

Green Mountains, Keswick Strain

Treatment Band Placement	Yield ⁴		Net necrosis ⁴	Stem-end browning ⁴	
				Severe ⁵	Total
	Bbl./A.	Bu./A.	%	%	%
1600# 6-9-15 ¹ per acre	137.8	379	26.9	48.1	56.6
1600# of 6-9-15 ¹ plus 5# Co per acre	96.7	266	25.1	43.0	55.9
1000# of 6-9-15 ¹ plus 2# Y per acre	115.3	317	37.8	42.4	47.6
1600# 6-9-15 ¹ per acre plus mixture ²	122.1	336	26.5	43.4	52.7
1000# Milorganite ³ per acre	131.1	361	31.4	49.5	55.5
Difference required for significance					
5% level	19.4	53.4			
1% level	27.2	74.7			

¹ Commercial mixture KCl as source of potash.

² One pound per acre of each of the following: yttrium, lanthanum, cerium, neodymium, thorium, and uranium. Also 0.42 pound per acre of rubidium and 0.66 pound per acre of cesium. All applied as nitrate or chloride.

³ 1000 pounds per acre of Milorganite plus sufficient 6-9-15, KCl, superphosphate and sea water magnesia to make the application equivalent to 1600 pounds per acre of 6-9-15.

⁴ The figures in these columns are the averages of 5 replicates, each 29 feet long, from a 5 x 5 Latin Square.

⁵ Considered to be of commercial importance.

TABLE 29

*Effect of Strontium and of Es-Min-El on Yield, Net Necrosis
and Stem-end Browning
Aroostook Farm, 1944*

Green Mountains

Treatment ¹	Yield ⁴ per acre		Net necrosis ⁵	Stem-end browning ⁵	
	Bbl.	Bu.		Severe	Total
Control	150.0	412	42.2	17.9	20.1
1 lb. Sr/A.	143.3	394	43.4	18.3	20.7
2 lbs. Sr/A.	143.5	395	49.2	17.8	20.4
5 lbs. Sr/A. ²	146.5	403	41.0	16.5	20.7
10 lbs. Sr/A.	154.1	424	43.5	17.5	20.3
50 lbs. Es-Min-El ³ /A.	145.4	400	55.2	13.3	16.3
100 lbs. Es-Min-El/A.	138.7	381	42.5	16.0	19.0
Control	150.4	414	42.0	14.9	18.8
Minimum difference required for significance 5% level	11.7	32.1			

¹ 1600 lbs. of a 6-9-15 commercial fertilizer per acre were applied in all cases.² 1 replicate missing.³ A product of the Tennessee Corporation; reported to contain Mn, Zn, Cu, Fe, Mg, B, and Co.⁴ Average of 8 replicates, each 50 ft. long, from an 8 x 8 Latin Square.⁵ Average of 5 replicates, each consisting of 1 bushel, taken from 5 blocks of the Latin Square. Tubers were examined after storage for 100 days or longer at 50° F.

TABLE 30

*Weeds in Wasteland as Aphid Hosts, at Presque Isle, Listed in Order of
Importance on Each Aphid*

Aphid Species	Weeds			
	Apterous form		Alate form	
	1943	1944	1943	1944
	Species of weeds (All age groups combined)			
<i>A. abbreviata</i>	Hemp nettle Smartweed Wild radish ¹ Wild rutabaga ¹	Smartweed Hemp nettle Wild rutabaga	Smartweed Wild radish Hemp nettle Wild rutabaga	Wild radish Smartweed Lamb's-quarters Wild rutabaga
<i>M. persicae</i>	Wild radish Wild rutabaga	Wild radish Wild rutabaga	Wild radish Wild rutabaga	Wild radish Wild rutabaga
<i>M. solanifolii</i>	Hemp nettle Smartweed Wild radish Wild rutabaga Lamb's-quarters	Wild radish Smartweed Hemp nettle Wild rutabaga	Wild rutabaga Wild radish Hemp nettle Smartweed Lamb's-quarters	Wild radish Smartweed Wild rutabaga Hemp nettle
All species combined	Wild radish Hemp nettle Wild rutabaga Smartweed Lamb's-quarters	Wild radish Wild rutabaga Hemp nettle Smartweed Lamb's-quarters	Wild rutabaga Wild radish Hemp nettle Smartweed Lamb's-quarters	Wild radish Wild rutabaga Hemp nettle Smartweed Lamb's-quarters

¹ Locally wild radish is known as kale and wild rutabaga as mustard.

TABLE 31

The Average Number of Wingless Myzus persicae and solanifolii per Plant Sample on Different Sampling Dates. Randomized Block, Population-levels Experiment. Aroostook Farm, Presque Isle, Maine, 1944

Date	Population Levels					
	Low		Intermediate		High	
	Mp*	Ms*	Mp	Ms	Mp	Ms
7/7	.007	0	.04	.020	0	0
7/12	.013	0	.007	.007	0	0
7/20	.186	.020	.067	.067	.180	.013
8/1	.927	.186	.913	.140	1.340	.047
8/3	1.733	.207	2.613	.207	4.420	.267
8/7	8.660	.833	8.893	.380	11.760	.720
8/9	1.488	.016	7.040	.656	14.976	.592
8/14	19.100	.680	39.800	3.660	40.030	2.210
8/16	2.040	.066	11.392	1.328	23.904	1.896
8/22	21.396	.992	115.032	5.800	153.648	8.832
8/25	6.511	.444	46.612	4.722	142.967	8.663
8/30	16.400	1.093	25.813	9.040	194.040	21.093

* Mp = *Myzus persicae* (green peach aphid).

Ms = *Macrosiphum solanifolii* (potato aphid).

TABLE 32

Yields of Tubers in Plots with Different Levels of Aphid Populations at Aroostook Farm, Presque Isle, 1944. Katahdin Variety

Population Level	Pounds per plot ¹		Bushels per Acre		
	U.S. No. 1 Grade	U.S. No. 2 and Pee-wees	U.S. No. 1 Grade	U.S. No. 2 and Pee-wees	Total yield
High	2904.5	341.5	272.0	32.0	304.0
Intermediate	3283.0	263.7	307.5	24.7	332.2
Low	4104.7	231.5	384.4	21.7	406.1

¹ Yields are the total from 18 randomized plots of 4 rows, each 38 feet in length.

TABLE 33

*Leafroll Control Experiment—Survival of Three Species of Aphids on Potato
Following Spray or Dust Applications at Four Farms
Houlton, Maine, 1944*

(Plots at Farm No. 1 sprayed 4 times; at Farm No. 2 and Farm No. 3
dusted 4 times; at Farm No. 4 dusted 3 times)

Date Farm		Number of living aphids per 99 leaves								% reduction in infestation
		<i>A. abbreviata</i>		<i>M. solanifolii</i>		<i>M. persicae</i>		Total aphids		
		Derris	Check	Derris	Check	Derris	Check	Derris	Check	
7/3	No. 1		4		0		1		5	
7/11			5		0		2		7	
7/19			7		1		3		11	
7/24		10	11	5	9	1	3	16	23	30
8/2		14	16	4	13	7	17	25	46	46
8/8		56	151	37	123	106	405	199	679	71
Av. % reduction		55		68		73		68		49
7/3	No. 2		4		1		1		6	
7/11			7		0		3		10	
7/18			7		1		6		14	
7/24		6	8	4	3	2	4	12	15	20
8/2		12	20	7	4	16	17	35	41	15
8/8		47	173	34	111	100	303	181	587	69
Av. % reduction		68		62		64		64		35
7/3	No. 3		3		1		1		5	
7/11			6		0		2		8	
7/18			7		1		4		14	
7/24		11	21	4	7	4	7	19	35	46
8/2		8	13	3	10	4	10	15	33	54
8/8		53	361	78	306	123	1052	254	1719	85
Av. % reduction		82		74		88		84		62
7/3	No. 4		2		0		1		3	
7/11			7		0		4		11	
7/18			5		1		6		12	
7/24		30	38	86	124	45	60	161	222	27
8/2		41	72	25	46	52	74	118	192	38
8/7		202	790	236	662	536	2774	974	4226	77
Av. % reduction		70		58		78		73		47
Av. % reduction at all four farms		71		68		79		74		48

TABLE 34

Leafroll Control Experiment—Early Harvest Yield of Potatoes at Four Farms Following Derris Spray or Dust Applications
Houlton, Maine, 1944

(Potatoes dug from August 29 to September 9.)

Farm	Yield of potatoes in barrels per acre under indicated conditions						Per cent increase in yield of derris plots over checks		
	Derris treated			Check			Vines pulled	Vines killed	Av.
	Vines pulled	Vines killed	Av.	Vines pulled	Vines killed	Av.			
No. 1	51	43	47	36	40	38	42	7.5	24
No. 2	29	36	32	25	29	27	19	24	22
No. 3	75	73	74	66	63	64	14	16	15
No. 4 ¹	69		69	61		61	—		13
Average.							25	15	17

¹ At Farm No. 4 tubers from "vines pulled" and "vines killed" plots were weighed together.

TABLE 35

Leafroll Control Experiment—Leafroll in Next Generation Foliage from Tubers from Four Farms Following Derris Spray or Dust Applications
Houlton, Maine, and Florida, 1944-1945

Farm	Percentage of leafroll in next generation foliage					
	Early harvest				Late harvest	
	Derris treated		Check		Derris treated	Check
	Vines pulled	Vines killed	Vines pulled	Vines killed		
No. 1	16.8	36.1	7.3	18.9	59.0	40.0
No. 2	0	9.9	0	2.6	51.9	31.1
No. 3	10.1	25.2	17.9	23.4	32.4	47.6
No. 4	2.7	7.4	0	9.9	25.5	20.0
Average	7.4	17.4	6.3	13.7	42.2	34.7

TABLE 36

Comparison of Insecticides Experiment—Yield of Potatoes Following Five Applications to Small Plots with a Hand Duster
Houlton, Maine, 1944

(Potatoes dug September 30. Check plots not included in analysis.)

Treatment	Av. lbs. of potatoes from 38 ft. of row in indicated block						Total pounds	Average pounds	Barrels per acre	Per cent increase over checks
	1	2	3	4	5	6				
10% DDT	54	66	68	70	68	83	409	68	174	78
3% DDT	50	63	70	61	58	72	372	62	158	61
0.75% rotenone	50	61	61	55	56	58	341	57	145	48

TABLE 37
Summary by Varieties in the 1941-1942-1943-1944 Florida Test Expressed on a Percentage Basis

Variety	Acreage entered				Not recommended for planting ¹ Percentage				Recommended for table stock seed ² Percentage				Recommended for planting for certification ³ Percentage			
	1941	1942	1943	1944	1941	1942	1943	1944	1941	1942	1943	1944	1941	1942	1943	1944
Bliss	78.	43.	38.	55.4	11	26	None	47	66	74	48	53	23	None	52	None
Chippewa	484.8	796.5	1646.7	3600.	40	67	23	78	43	21	43	15	17	12	34	7
Earlane #2	4.4	12.	0.0	64.	None	None	None	100	None	All	None	None	All	None	None	None
Gr. Mt.	2008.7	1578.	1914.6	2500.	18	10	9	33	46	54	46	35	36	36	45	32
Houma	136.	68.5	24.	17.	None	None	None	13	10	66	None	59	90	44	All	18
L. Cobbler	1280.9	1510.8	1915.5	2150.	9	25	6	45	47	56	30	37	44	19	64	18
Katahdin	763.5	1009.4	1465.	1475.	None	3	None	11	17	14	11	42	83	83	89	47
Pontiac	1	9.	0.0	0.1	None	None	None	None	None	None	None	None	All	All	None	All
Russett	0.0	16.	18.5	3.	None	None	91	None	None	All	None	100	None	None	9	None
Sebago	274.3	513.1	692.	945.	1	7	1	85	37	95	15	48	62	58	87	16
Squinia	0.0	22.5	63.6	60.	None	None	20	92	None	89	63	3	None	11	17	5
Warba	12.	6.	8.	9.	None	None	All	100	All	All	None	None	None	None	None	None
Mesaki	0	—	1.5	0.0	None	None	None	None	None	None	None	24	None	None	All	66
Monark	—	—	—	6.3	None	None	None	10	None	None	None	None	None	None	None	None
Sp. Rose	—	—	—	1	None	None	None	None	None	None	None	None	None	None	None	None
Early Rose	—	—	.1	.1	None	None	None	All	None	None	None	None	None	None	None	None

¹ Leafroll reading 2% or less.
² Leafroll reading 2.1% to 10%.
³ Leafroll reading 10.1% or over.

TABLE 38
Summary of Number of Lots of Seed Tested in Florida
1941-1942-1943-1944

Variety	Number of lots tested				Number of lots not recommended for seed stock ¹				* Number of lots recommended for growing								Percentage qualifying as foundation seed in	
									Table stock ²									
									Certified seeds									
	1941	1942	1943	1944	1941	1942	1943	1944	1941	1942	1943	1944	1941	1942	1943	1944	1943	1944
Bliss	7	4	4		2	7	0	3	3	2	1	3	2	0	3	0	75	0.0
Chippewa	33	57	142	314	7	29	20	228	16	15	56	49	10	13	66	37	46	12
Earlaine #2	1	1	0	3	0	0	0	3	0	1	46	0	1	0	—	—	—	—
Gr. Mt.	129	94	137	199	20	12	11	81	60	35	3	58	49	47	90	67	60	38
Houma	31	10	1	4	0	0	0	1	2	2	0	1	1	1	1	2	109	50
L. Cobbler	77	88	120	188	11	19	3	70	30	42	42	54	33	23	75	1	63	23
Katabdin	71	83	109	133	4	1	0	16	7	15	8	50	60	67	101	67	51	51
Pontiac	1	1	0	1	0	0	0	—	0	0	—	1	0	0	1	1	—	100
Russett	0	2	4	2	0	0	2	—	0	0	—	—	—	—	—	—	—	0.0
Sebago	44	55	81	90	2	2	1	22	13	15	12	32	29	33	68	25	83	27
Sequoia	2	1	1	1	0	0	0	5	4	1	5	1	0	2	2	1	25	14
Warba	0	6	6	7	0	0	0	1	2	1	1	0	—	0	0	0	0	0.0
Wohawk	—	—	—	21	—	—	—	3	—	—	—	5	—	—	1	13	100	61
Op. Rose	—	—	—	1	—	—	—	1	—	—	—	0	—	—	—	—	—	0.0
Meado	—	—	—	0	—	—	—	—	—	—	—	—	—	—	—	—	100	—
Early Rose	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—

¹ More than 10 per cent leafroll.

² Not more than 10 per cent leafroll.

³ Not more than 2 per cent total virus.

TABLE 39
Summary of Acreage Represented in Florida Test
1941-1942-1943-1944

Variety	Acreage represented				Not recommended for planting ¹				Recommended as table stock seed ²				Recommended for planting for certification			
	1941	1942	1943	1944	1941	1942	1943	1944	1941	1942	1943	1944	1941	1942	1943	1944
Bliss	.78	43	38	55.4	8.5	11	0	28.3	51.5	32.0	18.0	27.1	18	0.0	20.0	0.0
Chippewa	484.8	796.5	1646.7	3600	191	530.4	381.5	2821.0	249.3	169.6	710.4	516.3	84.5	96.5	551.8	292.7
Earlaine #2	4.4	12	0	64	0	0	0	0.0	0	12.0	0	0.0	4.4	0	—	0.0
Gr. Mt.	2008.7	1578	1914.6	2500	358.9	163.5	181.4	945.8	932.0	851.5	887.2	747.7	717.7	563.0	846.0	804.5
Houma	136	68.5	24	17	0	0	0	4.0	13.5	38.5	0	10.0	122.5	30.0	24.0	3.0
L. Cobbler	1230.9	1510.8	1915.5	2150	116.6	382.5	17	1050.3	592.5	840.5	797.0	714.2	551.8	287.8	1111.5	385.5
Katabdin	763.5	1099.4	1465	1475	0	28	0	182.9	182.5	137.7	163.3	599.4	631.0	843.7	1363.7	692.7
Pontiac	1	9	0	0.1	0	0	0	0	0	0	0	0.0	1.0	9.0	0	0.1
Russett	0	16	18.5	3	0	0	17	0	0	16.0	0	3.0	0	0	1.5	0.0
Sebago	274.3	513.1	692	945	3.3	32	7	379.9	100.0	183.5	111.0	413.0	171.0	297.6	574.9	152.1
Sequoia	0	22.5	63.6	60	0	0	13	55.0	0	20	40.6	2.0	0	2.5	10.0	3.0
Warba	12	6	8	9	0	0	0	9.0	12	6	8	0.0	0	0	0	0.0
Mesaba	0	0	1.5	0	0	0	0	0	0	0	0	0.0	0	0	1.5	0.0
Monawk	—	—	—	0.3	0	0	0	0.2	0	0	0	1.5	0	0	0.5	4.6
Sp. Rose	—	—	—	1	0	0	0	1	0	0	0	0	0	0	0	0.0
Early Rose	—	—	—	.1	0	0	0	.1	0	0	0	.1	0	0	0	6.0

¹ More than 10 per cent leafroll.

² Not more than 10 per cent leafroll.

³ Not more than 2 per cent leafroll.

TABLE 40

Development of Late-Blight Rot in Green Mountain Potatoes Stored at Different Temperatures in 1944

Temperature of bin, Degrees F.	Late-blight rot developing in storage ¹	
	Experiment ² 1	Experiment ³ 2
	Per cent	Per cent
36	1.9	Trace
40	14.0	11.1
50	42.1	34.8
60	41.7	37.6
70	44.2	41.6
Commercial storage	34.4	41.4
Least required for significance at 1% level	6.06	5.90
Least required for significance at 5% level	4.52	4.45

¹ Average of ten, replicated 50-pound samples for each percentage figure given.

² Harvested and placed in storage September 10, 1944.

³ Harvested and placed in storage September 19, 1944.

TABLE 41

Late-Blight Rot Developing in Potatoes Subjected to High Temperature Treatments

Experiment	Time elapsing before heat treatment applied ¹	Temperature of treatment ²	Late-blight rot developing in storage ³ Per cent
1	None	100-102° F. during day. Dropped to 85° F. during night	26.5
	24 hours	do.	38.6
	48 hours	do.	43.4
Control	—	45° F. — 50° F. (Commercial storage)	37.8
2	None	102-104° F.	16.8
	24 hours	do.	30.1
	48 hours	do.	35.2
Control	—	45° F. — 50° F. (Commercial storage)	42.7

¹ Tubers were harvested and brought to the laboratory where the heat treatment was applied. One lot was treated immediately, another after a 24-hour interval, and the other after an interval of 48 hours.

² Temperatures obtained in dry heat chambers fluctuated, being cooler during night. Each lot treated for a 24-hour period.

³ Average of three 50-pound samples for each treatment.

TABLE 42

Yield Comparison of Green Mountain Plots Sprayed with Bordeaux Mixture According to Different Schedules for the Season 1944

Spray schedule	Number applications for season	Yield per acre ¹		Condition of foliage in field	Protective coefficient ²
		Barrels	Bushels		
Field sprayed at 7- to 10-day intervals for entire season	7 ³	121±2.92	331±8.18	Green No late blight	100
First two applications omitted	5	123±2.53	338±7.20	Trace Late blight early in season ⁴	86
Last two applications omitted	5	116±2.53	319±7.01	Trace Late blight, also early blight	72
Two applications omitted at critical periods	5 ⁵	118±2.72	323±7.20	Trace Late blight	75

¹ Average of 12 replicated 1/100 acre plots for each treatment.

² Equal to infective index of full time spray schedule plots (which is 100) divided by infective index of treatment compared using early- and late-blight disease. (Adopted from Horsfall, James G. and John W. Heuberger. Measuring magnitude of a defoliation disease of tomatoes. *Phytopath.* 32:226-232. 1942.)

³ The first application was made July 10, last application for the season September 5.

⁴ Late blight first noted July 8 which did not spread extensively.

⁵ Some leaves dying because of maturity and early-blight infection September 10.

⁶ Applications omitted July 19 and August 1 which appeared to be critical for the control of late blight.

No significant differences at the 1 per cent and 5 per cent level between yield rates.

TABLE 43

Comparison of Yield Rate of a Normal and Delayed Spray Program in the Sebago Variety 1944

Fungicide	Yield rate per acre ¹			
	Normal spray program		Delayed spray program	
	Barrels	Bushels	Barrels	Bushels
Bordeaux	111±2.22	305±6.20	115±1.59	316±3.97
Basic copper sulphate	103±3.31	283±8.96	100±1.94	275±6.42
Unsprayed control	107±6.23	294±17.13	107±6.23	294±17.13

¹ Average of 12 replicated 120-foot 1-row plots.

TABLE 44

*Summary Yields—Barrels and Bushels Per Acre for
Green Mountains Sprayed with Different Fungicides
1944*

Fungicide	Formula used	Yield per acre ¹	
		Barrels	Bushels
Bordeaux	10-5-100	122±5.06	336±12.14
Basi cop ²	5-100	126±3.71	346±11.80
Tri basic copper sulphate ³	5-100	144±4.65	397±7.75
Copper Compound A ⁴	6-100	130±5.39	358±14.16

¹ Yield based on means from four replicated one-row 100-foot plots for each treatment.

² Manufactured by Sherwin-Williams Company, Cleveland, Ohio, and said to contain 52 per cent metallic copper.

³ Supplied by Phelps Dodge Refining Corporation, 40 Wall Street, New York, New York, and said to contain 52 per cent metallic copper.

⁴ Supplied by E. I. Du Pont de Nemours and Company, Inc. Technically tetra copper calcium oxychloride.

TABLE 45

*Effect of Organic Fungicides on Yield Rate and Control of Late Blight
Tuber Decay
1944*

Fungicide	Formula	Yield rate ¹		Late blight tuber rot
		Barrels	Bushels	
Bordeaux control	10-5-100	97±1.91	268± 5.05	Per cent 0
604 ² (2,3-dichloro naphthoquinone-1,4)	1-100	98±2.47	270± 7.43	1
604 ² plus zinc sulfate	1-1½-100	101±2.20	276± 6.88	1
Fermate ³ (ferrie dimethyl dithiocarbamate)	2-100	98±1.65	271± 4.93	2
Fermate ³ and zinc sulfate	2-1½-100	92±3.30	253± 9.36	3
Dithane ⁴ (disodium ethylene bisdithiocarbamate)	4-100	100±2.47	276± 6.33	4
Basi-cop ⁵ (Basic-copper sulfate)	5-100	95±3.85	260±10.46	Trace
Basi-cop ⁵ and zinc sulfate	5-1½-100	92±2.20	252± 5.78	Trace

¹ Based on six, 75 replicated 1-row plots.

² Supplied by Naugatuck Chemical Division of U. S. Rubber Company, Naugatuck, Connecticut.

³ Supplied by F. I. Du Pont de Nemours and Company, Inc., Elizabeth, New Jersey.

⁴ Supplied by Rohm and Haas, Philadelphia, Pennsylvania.

⁵ Supplied by Sherwin-Williams Company, Cleveland, Ohio.

TABLE 46

Yield Comparison of Green Mountain and Katahdin Plots Sprayed with Bordeaux Mixture Prepared with Different Formulae and Applied with Tractor-Power Machine 1944

Formula	Total copper sulfate used for season	Yield per acre ¹		Protective coefficient ²	
		Katahdin	Green Mountain	Katahdin	Green Mountain
	Pounds	Barrels	Barrels	Per cent	Per cent
10-10-100	91.0	78.2±1.96	133.6±1.96	100	100
10- 5-100	91.0	82.6±1.51	125.1±1.05	98	100
8-8-100	72.8	80.9±2.11	123.7±1.20	76	93
8-4-100	72.8	88.1±1.36	123.6±1.66	67	89
6-6-100	54.6	87.3±1.81	127.6±1.51	73	89
6-3-100	54.6	90.3±1.21	128.8±0.30	86	92
4-4-100	36.4	87.8±1.05	127.7±2.26	73	81
4-2-100	36.4	86.8±1.66	120.9±2.26	81	83
Unsprayed control	—	92.7±1.92	—	Nearly dead	

¹ Significance is 8.5 barrels at 1% level and 6.4 barrels at the 5% level.

² For flea beetle injury calculated by formula of Horsfall and Heuberger expressed as percentage of the index of the 10-10-100 control.

TABLE 47

The Effect on Yield of Spraying Katahdin Potatoes with Rotenone in Combination with Basic Copper Sulfate

Treatment	Formula used	Yield per acre ¹		Increase or decrease		
		Barrels	Bushels	Barrels	Bushels	Protective coefficient ³
						Per cent
Basic copper sulfate	5-100	113±2.07	312±11.92	—	—	100
Basic copper sulfate with rotenone ²	5-4-100	128±1.75	352± 4.93	+15	+40	101
Unsprayed control	—	83±5.28	229±14.59	—30	—83	Plants dead

¹ Average of 18 replicated 120-foot one-row plots for each treatment.

² Rotenone applied at the rate of 4 pounds ground Derris Root containing 4.8 per cent rotenone in 100 gallons of water. Plots received seven spray applications for the season at the rate of approximately 135 gallons per acre.

³ Significance at 1% level is 8.4 barrels or 23.1 bushels.

Significance at 5% level is 3.3 barrels or 9.1 bushels.

TABLE 48

The Effect on Yield Rate, Early Blight Infection, and Flea Beetle Injury from Spraying Green Mountain Potatoes with Copper Fungicides and with Combinations of These Fungicides with Rotenone. Rotenone Alone and with Zinc Sulfate also Included
1944

Fungicide	Formula used	Yield rate per acre ¹		Protective Coefficient ²			
		Without rotenone	With rotenone ³	Without rotenone	With rotenone	Without rotenone	With rotenone
		Barrels	Barrels	Per cent	Per cent	Per cent	Per cent
Bordeaux	10-5-100	126±3.10	122±2.86	100	111	100	100
Basic-copper sulfate	5-100	127±2.24	130±3.82	87	98	85	93
Rotenone	4-100	—	111±1.80	—	52	—	74
Rotenone and zinc sulfate	4-1½-100	—	—	—	52	—	65
Unsprayed control	—	98±1.12	—	—	48	27	—

¹ Based on average of nine replicated single row plots, each 100 feet long for each treatment.

² Adopted from method of Horsfall, James G. and John W. Heuberger. Measuring magnitude of a defoliation disease of tomatoes. *Phytopath.* 32:226-232. 1942. Bordeaux used as the control and has a Protective Coefficient of 100 per cent for these data.

³ Rotenone applied at rate of four pounds of Derris Root containing 4.8 per cent rotenone in 100 gallons of water.

TABLE 49

The Effect on Yield of Spraying Green Mountain Potatoes with Basic Copper Sulfate and with a Combination of This Material with "Spray Kast" ¹
1944

Fungicide	Formula used	Yield per acre ²	
		Barrels	Bushels
Basic copper sulfate	5-100	128±2.86	352±9.10
Basic copper sulfate and Spray Kast	5-6-100	123±3.37	388±8.43

¹ Supplied by Woburn Chemical Corp., Harrison, New Jersey.

² Based on average of four replicated 100-foot single row plots for each treatment.

Note. There appeared to be no obvious difference in the condition of the foliage comparing the two treatments.

TABLE 50

The Effect on Yield of Spraying Green Mountain Potatoes with Basic Copper Sulfate and this Material in Combination with Soy Bean Oil

Fungicide	Formula used	Yield per acre ¹	
		Barrels	Bushels
Basic copper sulfate	5-100	149±4.05	408±7.39
Basic copper sulfate and oil, and emulsified ²	5-1-100	150±2.86	413±9.70

¹ Based on average yield of seven replicated 92-foot one-row plots for each treatment.

² Made to contain five pounds basic copper sulfate, one quart Soya Bean oil and 1 pint Santomerse (detergent) in 100 gallons of water.

TABLE 51

Yield Comparison of Puratized N5-X and Basic Copper Sulfate Sprayed onto the Green Mountain Variety¹
1944

Fungicide	Formula used	Yield per acre ²	
		Barrels	Bushels
Basic copper sulfate	5-100	128±2.36	352±9.10
Puratized N5-X	1-1000 ³	126±3.03	347±6.07
Puratized N5-X	2-1000 ⁴	115±1.69	316±6.07

¹ Puratized N5-X supplied by Puratized, Inc., 250 East 43rd St., N. Y., N. Y., said to contain 11.6 per cent toxicant.

² Yield average of four replicated 100-foot single row plots for each treatment.

³ 1 part in 1000 parts of water is dilution of 1 to 8620.

⁴ 2 parts by volume in 1000 parts of water is dilution of 1 to 17240.

Note. The plots sprayed with Puratized N5-X appeared inferior to those sprayed with Basic copper sulfate.

TABLE 52

Results of Inarch Grafting Plants from Purple Top Sebago Tubers into Healthy Katahdin Plants

Lot No.	No. of grafts	No. grafts producing weak sprouts ¹			Symptoms resulting from grafts ²
		Grafts	Diseased controls	Healthy controls	
1	16	9	13	0	No current seasonal purple top. Three grafts possibly apical leafroll
2	6	6	6	1	No current seasonal purple top. Two grafts seem to be apical leafroll
3	18	15	17	0	No current seasonal purple top. All plants appear to be normal

¹ The tubers were examined the following spring and the character of the sprouts observed.

² Current seasonal symptoms in 1943 and symptoms of plants produced by the tubers that were planted in 1944.

TABLE 53

Yield Rate from Seed Stocks that Have Recovered from Purple Top

Seed lot	Variety	Source of seed stock ¹	Yield per acre ²		Loss or Increase	Odds
			Barrels	Bushels		
1	Sebago	Purple top plants selected 1941	127±2.31	348±6.77	+3	1.00 to 1.00
2		Purple top plants selected 1942. Progeny from wilted tubers	129±3.46	355±8.76	+5	1.18 to 1.00
3		Purple top plants selected 1942. Progeny from medium soft tubers ³	122±3.20	335±8.00	-2	1.00 to 1.00
4		Purple top plants selected 1942. Progeny from firm tubers ³	115±3.29	315±9.55	-9	4.64 to 1.00
5		Healthy controls	124±2.99	340±8.41	—	—
6	Katahdin	Purple top plants selected 1942. Progeny from soft tubers	121±2.30	332±7.70	+21	19230 to 1.00
7		Purple top plants selected 1942. Progeny from hard tubers	109±3.14	299±8.51	+9	8.48 to 1.00
8		Healthy controls	100±2.05	275±4.33	—	—

¹ Hills having purple top were harvested in 1941 and 1942 and were perpetuated in the field each year until 1944 when they were used for these yield studies.

² Based on 18 replicated 4-hill plots for each yield rate given.

³ Seed stocks had 14 per cent leafroll which might have depressed the yield rate.

Note: Check Katahdin 98% healthy
PT 1942 (hard tubers) 84% healthy
PT 1942 (soft tubers) 93% healthy

Check Sebago 98% healthy
PT 1941 93% healthy
PT 1942 (hard) 86% healthy
PT 1942 (medium) 83% healthy
PT 1942 (soft) 95% healthy

TABLE 54

Development of Purple Top in Katahdin and Sebago Plants Grown from Seed Stocks that Have Recovered from the Disease

Lot No.	Variety	Year selected as purple top ¹	Kind of seed pieces planted	No. plants in test	Purple Top Developing in plants ²
					Per cent
1	Katahdin	1941	Whole tubers	25	4.0
2		1941	Cut tubers	25	0.0
3		1942	Whole tubers	100	0.0 (2?) ³
4		1942	Cut tubers	100	0.0
5		Healthy controls	Cut tubers	125	1.6 (1.6?) ³
6	Sebago	1941	Whole tubers	25	4.0
7			Cut tubers	25	4.0
8		1942	Whole tubers	75	1.3 (6.6?) ³
9			Cut tubers	75	1.3 (2.6?) ³
10		Healthy controls	Cut tubers	75	1.3 (1.3?) ³

¹ Indicates year the seed stock was selected as being purple top.

² Purple top developing in field in plants from seed stocks previously infected with purple top.

³ Plants that possibly had purple top but diagnosis not definite.

TABLE 55

Comparison of the Number of Aphids on Leaflets from Healthy and Purple Top Plants

Position on plant	Average number of aphids ¹ per leaflet		Ratio Number Aphid Healthy vs. Purple Top
	Healthy plants	Purple Top plants	
Top	33.0	73.0	2.2:1
Middle	26.0	80.0	3.1:1
Bottom	39.0	89.0	2.3:1
Average	32.7	80.6	2.5:1

¹ The dominant aphid species was *Macrosiphum solanifolii* Ashmead. Large numbers of *Aphis abbreviata* Patch, were present on isolated plants. *Myzus persicae* Sulzer and *M. pseudosolani* Theobald, were present in smaller numbers. Data based on counts from 22 healthy and diseased plants.

TABLE 56

*Acid Mercuric Chloride Used in Dipping Seed Potatoes at
Aroostook Farm, 1944—5-Minute Dip*

Description of sample	Acid per cent	Mercuric Chloride per cent
	Hydrochloric	
Sample taken before dipping	.04	.1739
Sample taken after 5th dipping	.03	.1639
Sample taken after 10th dipping	.03	.1602
	Acetic	
Sample taken before dipping	.56	.1760
Sample taken after 5th dipping	.55	.1743
Sample taken after 10th dipping	.54	.1741

TABLE 57

*Acid Mercuric Chloride Used in Dipping Seed Potatoes at
Aroostook Farm, 1944—Acetic Acid 90-Minute Dip
and Standard Dip*

Description of sample	Acetic acid per cent	Mercuric Chloride per cent
Acidified		
Sample taken before dipping	.53	.0905
Sample taken after 5th dipping	.51	.0901
Sample taken after 10th dipping	.49	.0876
Sample taken after 15th dipping	.48	.0848
Sample taken after 20th dipping	.47	.0819
Sample taken after 25th dipping	.47	.0804
Standard		
Sample taken before dipping		.0832
Sample taken after 5th dipping		.0739
Sample taken after 10th dipping		.0662
Sample taken after 15th dipping		.0594
Sample taken after 20th dipping		.0483
Sample taken after 25th dipping		.0494

TABLE 58

*Early Harvesting as a Means of Controlling Leafroll in Foundation Seed Plots
1942-1944*

Variety	No. of Plots Early Harvested			No. of Plots Late Harvested			Average per cent of L.R. in plots early harvested			Average per cent of L.R. in plots late harvested		
	1942	1943	1944	1942	1943	1944	1942	1943	1944	1942	1943	1944
Bliss Triumph	0	1	0	0	0	0	0	0.0	0.0	—	—	—
Chippewa	6	11	12	2	2	8	.35	.14	.3	7.1	.8	4.8
Green Mountain	7	14	11	14	11	16	.1	.06	.4	1.2	.9	4.2
Irish Cobbler	6	10	14	7	5	7	.23	.1	.4	1.07	.4	1.9
Sebago	8	8	4	12	9	9	.07	.12	.5	.77	.5	6.3
Katahdin	8	7	4	7	10	8	.18	.04	.2	.32	.5	.7
Houma	3	0.0	1	4	0.0	1	0.0	0.0	.5	.9	0.0	—
Monroe	—	—	10	—	—	8	—	—	.49	—	—	10.7

TABLE 59

Total Acreage by Variety and Number of Lots Entered in the Foundation Seed Program and Qualifying as Foundation Seed 1942-1944

Variety	Acreage qualifying as foundation seed ¹			Number of lots qualifying		
	1942	1943	1944	1942	1943	1944
Bliss Triumph	None	2	None entered	None entered	1	None entered
Chippewa	13.7	24.4	25.2	8	10	11
Sebago	49.5	43.4	19.	19	17	7
Katahdin	31.2	40.75	21.7	15	16	9
Green Mountain	45.1	71.	73.2	16	20'	15
Irish Cobbler	21.5	38.	79.7	12	15	19
Houma	7.3	.5	.5	7	None entered	1
Sequoia	1	.75	None	1	0	None
Mohawk	—	—	4.2	—	—	12

¹ 2 per cent or less total virus.

TABLE 60

Relation of pH and Replaceable Calcium and Potassium to Potato Scab and Potato Yield

Number of plots	pH range	Replaceable calcium lb. per acre	Replaceable potassium lb. per acre	Scab index	Acre yield barrels
38	4.08 — 5.41	1313	400	0	151
20	4.52 — 5.53	2458	394	0.1 — 5.0	149
19	5.35 — 6.01	2778	477	5.1 — 25.0	153
23	5.65 — 6.28	3084	509	25.1 and over	149

Each plot consisted of two square rods (six 33-foot rows).

Scab index is a weighted average indicating the portion in per cent of the surface area of tubers covered with scab lesions.

TABLE 61

Potato Yields as Affected by Size of Whole and Cut Seed—Maine—1944

Planted May 30, 1944

Harvested October 13, 1944

Treatment No.	Size of tubers used as seed	Average weight of seed piece				Acre yield in bushels			All varieties	
		G.M.	Kat.	Seb.	All varieties	G.M.	Kat.	Seb.	Bushels	Barrels
		OZ.	OZ.	OZ.	OZ.					
1	1"-1½" Whole	.50	.52	.61	.54	292	271	281	281	102
2	1½"-1¾" Whole	.88	1.00	.94	.94	317	286	356	320	116
3	1½"-1 11/16" Whole	1.36	1.42	1.38	1.39	328	317	331	326	118
4	1 11/16"-1 7/8" Whole	1.72	1.81	1.75	1.76	360	302	361	341	124
5	1 11/16"-1 7/8" Split	.91	.88	.91	.90	325	282	306	304	111
6	1 7/8"-2 1/8" Cut	.94	.94	.91	.93	288	271	296	282	103
7	1 7/8"-2 1/8" Cut	1.45	1.44	1.41	1.43	332	280	344	319	116
8	1 7/8"-2 1/8" Cut	1.91	1.91	1.94	1.92	358	303	387	349	127
Minimum difference for significance at 5% level									23.2	8.9
at 1% level									30.2	11.0

Size of plot: Single row 24' long 3' apart.

Number of replicates: 6.

Spacing: 9 inches.

Seed source: McNally.

TABLE 62
Effect of Certain Seed Treatments on Number, Size, and Weight of Tubers¹

Treatment	Tubers less than 1 1/4" (Culls)		Tubers 1 1/4"-2 1/4"		Tubers over 2 1/4"		Total No. of tubers	Total wt. of tubers	No. of stems per hill
	No. of tubers	Wt. in lbs.	No. of tubers	Wt. in lbs.	No. of tubers	Wt. in lbs.			
8 inch spacing	58	1.2	186	35.8	8	1.5	247	38.5	2.4
10 inch spacing	53	1.1	172	34.3	3	1.7	228	37.1	2.3
12 inch spacing (control)	28	.6	134	27.7	7	4.3	169	32.6	2.3
Transplantone ²	47	.9	158	31.3	3	1.8	208	34.0	2.7
Indole acetic acid ³	28	.6	136	29.1	6	3.6	170	33.3	2.2
Ethylene chlorohydrin ⁴	37	.8	151	29.1	4	2.1	192	32.0	2.4
Thiouracil ⁵	44	.9	161	30.2	4	2.2	209	33.3	3.3
Thiouracil ⁶	51	1.0	152	29.9	2	1.4	205	32.3	2.8
Thiouracil ⁷	42	.8	153	28.7	2	1.1	202	30.6	2.8
Minimum difference for significance at									
5% level	12	.3	16	2.8		1.4	22	3.0	
1% level	16	.4	22	3.7		1.9	29	4.0	

¹ Yields based on average of six 25 ft. row replicates per treatment.

² Cut seed pieces soaked 24 hrs. in solution, 1 oz. to 10 gal. Transplantone is a patented product composed of several vitamins and growth substances.

³ Cut pieces soaked 1 hr. in .01% solution.

⁴ Whole tubers exposed to vapor of 1 c.c. of anhydrous chemical per kilogram of seed in a closed container for 24 hrs.

⁵ Cut pieces soaked in 1% solution for 1 hr.

⁶ Whole tubers soaked in .1% solution for 1 hr.

⁷ Whole tubers soaked in 2% solution for 1 hr.

TABLE 63

Experimental Potatoes Grown at Aroostook Farm in 1944—R. Akeley

Date	Stake No.	Variety	Starch by balance %	Wt. 5 kg. in w.	Water displ.	Sp. g.	No. to 5 kg.	Total solids
10/11	1	627-103	13.70	365	4575	1.0787	35	21.6
10/11	2	47156	13.95	370	4275	1.0799	25	22.45
10/5	3	Mohawk	14.45	380	4550	1.0823	25	21.13
10/5	4	Pontiac	10.95	310	—	1.0661	23	19.1
10/5	5	Katahdin	12.45	340	4250	1.0730	25	19.5
10/11	6	Menomonie	12.05	332	4475	1.0711	18	20.4
10/11	7	Erie	12.85	348	4550	1.0748	35	20.6
10/6	8	Earlaine #2	10.10	293	4550	1.0622	29	17.15
10/26	9	47258	12.65	344	4750	1.0739	30	19.23
10/25	10	Rural New Yorker	14.20	375	4300	1.0811	34	22.5
10/11	11	Pawnee	13.10	353	4650	1.0760	37	21.25
10/5	12	Sebago	11.05	312	4650	1.0666	26	19.65
10/3	14	Sequoia	12.20	335	4200	1.0718	28	20.6
10/26	15	Chippewa	11.35	318	4675	1.0679	33	19.53
10/19	16	47102	11.70	325	4125	1.0695	26	19.0
10/6	17	Green Mountain	14.55	382	4550	1.0827	28	21.55
10/18	18	627-126	14.00	371	4550	1.0804	48	21.3
10/18	19	47402	11.70	325	4625	1.0695	28	20.2
10/18	20	Calpride	12.30	337	4450	1.0723	27	19.4
10/17	21	White Rose	12.10	333	4625	1.0714	22	18.5
10/17	22	47194	11.55	322	4575	1.0688	27	19.45
10/25	23	47148	13.05	352	4250	1.0757	22	21.8
10/25	24	Russet Burbank	13.60	363	4650	1.0783	32	20.53
10/17	25	47523	10.55	302	4550	1.0643	24	19.2
10/21	151	Red Warba	14.35	378	4450	1.0818	40	22.4
11/8	152	96-56	13.60	363	—	1.0783	28	20.0
11/15	153	De Soto	13.70	365 ¹	—	1.0787	75	18.73
10/17	155	46952	12.55	342	4250	1.0734	32	20.2
10/17	156	47496	12.05	332	—	1.0711	43	19.4
11/10	158	47499	13.45	360	—	1.0776	30	21.8
11/7	159	47507	12.30	337	—	1.0723	44	19.2
10/21	160	Triumph	13.10	353	4475	1.0760	37	20.53
10/30	161	Mesaba	14.35	378	—	1.0818	35	21.8
11/2	162	96-44	13.60	363	—	1.0783	24	21.6
10/9	163	Chippewa	11.80	327	4000	1.0700	37	19.2
10/9	166	Earlaine	13.10	353	4625	1.0760	39	20.73
11/10	229	B67-11	15.05	392	—	1.0648	—	22.4
10/31	230	B175-7	12.65	344	—	1.0739	32	19.2
10/11	231	Earlaine	12.55	342	4500	1.0734	37	20.1
11/10	232	B 70-5	13.60	363	—	1.0783	25	20.5
10/25	233	B 171-19	11.55	322	4475	1.0688	38	19.0
10/18	234	B 73-10	13.50	361	4600	1.0778	26	20.2
11/9	235	B 235-16	13.30	357	—	1.0769	28	18.8
10/30	236	46952	12.55	342	—	1.0734	36	20.4
11/9	237	B 61-3	13.95	370	—	1.0799	32	20.1
11/10	238	B 66-2	14.05	372	—	1.0804	41	20.5
11/10	239	B 176-5	13.60	363	—	1.0783	36	19.9
11/7	240	B 192-17	12.85	348	—	1.0748	35	19.9
11/8	241	Red Warba	14.05	372	—	1.0804	44	20.8
11/8	243	B 75-4	14.95	390	—	1.0844	34	21.8
11/7	244	B 177-14	13.30	357	—	1.0769	32	20.4
11/8	277	B 69-12	12.20	335	—	1.0718	27	19.1
10/19	278	B 194-13	10.55	302	4625	1.0543	25	17.4
11/10	279	B 73-2	12.95	350	—	1.0753	25	19.2
10/30	280	B 188-9	13.80	367	—	1.0792	27	21.4
10/3	281	Mohawk	14.55	382	4000	1.0827	24	20.5
10/3	282	Katahdin	12.10	333	4175	1.0714	28	18.6
10/30	283	X 815-20	12.95	350	—	1.0753	32	20.1
10/28	284	Chippewa	11.05	312	—	1.0666	30	17.2
10/31	285	B 174-5	11.05	312	—	1.0666	26	18.1
11/10	286	B 73-18	14.35	378	—	1.0818	21	21.5
10/19	287	B 189-14	14.85	388	4500	1.0841	30	24.1
10/19	288	B 188-69	13.80	367	4475	1.0792	29	21.6
11/15	289	X 815-17	10.45	300	—	1.0638	28	18.6
10/19	290	B 188-61	13.05	352	4650	1.0757	26	20.0
10/3	291	Green Mountain	14.70	385	4000	1.0834	28	22.2
10/3	292	Sebago	12.45	340	4200	1.0730	28	21.0

TABLE 64

Experimental Potatoes—Presque Isle Farm (Akeley)
Named Domestic Varieties—1944 Crop

Variety	Starch by balance %	No. to 5 kg.	Weight 5 kg. (11*) in water g.	Total solids exper- imental	Total solids Foth Table 1907	Difference
Earlaine #2	10.10	29	293	16.60	15.90	0.70
Pontiac	10.95	23	310	19.10	16.71	2.39
Chippewa	11.05	30	312	17.20	16.81	0.39
Sebago	11.05	26	312	19.65	16.81	2.74
Chippewa	11.35	33	318	18.55	17.10	2.45
Chippewa	11.80	37	327	19.20	17.54	0.66
Menomonie	12.05	18	332	20.40	17.80	2.60
Katahdin	12.10	28	333	18.65	17.85	0.80
White Rose	12.10	22	333	18.50	17.85	0.65
Sequoia	12.20	28	335	20.60	17.93	2.67
Calpride	12.30	27	337	19.40	18.08	1.37
Sebago	12.45	28	340	20.60	18.19	2.41
Katahdin	12.45	25	340	19.50	17.85	1.61
Earlaine	12.55	37	342	20.10	18.29	1.81
Erie	12.85	35	348	20.60	18.57	2.03
Earlaine	13.10	39	353	20.75	18.83	1.92
Pawnee	13.10	37	353	21.25	18.83	2.42
Triumph	13.10	37	353	20.55	18.83	1.72
Russet Burbank	13.60	32	363	20.55	19.32	1.13
De Sota	13.70	75	365	18.75	19.41	-0.66
Red Warba	14.05	44	372	20.85	19.77	1.08
Rural New Yorker	14.20	34	375	22.50	19.92	2.58
Mesaba	14.35	35	378	21.80	20.07	1.73
Red Warba	14.35	40	378	22.40	20.07	2.33
Mohawk	14.45	25	380	22.15	20.10	1.99
Mohawk	14.55	24	382	21.55	20.26	1.29
Green Mountain	14.55	28	382	21.55	20.26	1.29
Green Mountain	14.70	28	385	22.25	20.41	1.84

TABLE 65

*Average Loss in Weight of Potatoes Stored at 32°, 36°, and 50° F.
Over a Period of 7 Months*

Loss by Variety		Loss by Month		Loss by Temperature	
Variety	Average % loss in 7 months at 32°, 36°, 50° F.	Months	Average % loss in 6 varieties at 3 tem- peratures	Tempera- ture	Average % loss of 6 varieties over 7 months
Katahdin	4.3	1	2.5	32° F.	7.0
Cobbler	4.3	2	3.9		
Chippewa	5.3	3	4.3	36° F.	4.6
Mohawk	6.0	4	4.9		
Green Mountain	6.5	5	6.2	50° F.	6.0
Sebago	8.7	6	9.3		
		7	9.9		

Average Per Cent Loss During 7 Months Storage at All Temperatures

Variety	32° F.	36° F.	50° F.	60° F.	70° F.
Katahdin	5.4	3.0	4.5	12.5	12.8
Cobbler	4.6	3.2	5.2	14.2	13.9
Chippewa	5.6	4.0	6.4	16.5	15.5
Mohawk	7.8	5.0	5.2	9.2	10.5
Green Mountain	8.0	5.1	6.4	14.9	16.5
Sebago	10.5	7.2	8.4	20.3	19.5

FOODS AND NUTRITION

The research on foods and nutrition has continued along the lines of past years. The nutritional values of various food crops are under investigation and the retention of these values is being studied through various methods of processing.

FOODS

VITAMIN C VALUE OF MAINE FOODS. Elizabeth F. Murphy.
Tomato. VARIETY AND SEASON: Twenty seven varieties of tomatoes were grown in Orono and tested for vitamin C. The values ranged from 17.0 to 35.6 mg. per 100 grams. These included six varieties which were tested for the seventh consecutive season.

TABLE 66

Vitamin C Values of Ripe Tomatoes During 7 Seasons

Variety	Mg. per 100 grams							Av.
	1938	1939	1940	1941	1942	1943	1944	
Best of All	26	30	38	29	33	30	30	30.9
Waltham Foreing	24	29	36	31	24	28	27	28.4
Comet	27	32	33	30	28	30	33	30.4
Farthest North #1	26	30	31	30	24	24	24	27.0
Bestal	18	25	23	26	19	19	22	21.7
P.S. Earliana	20	22	25	25	18	21	22	21.9
Average	23.5	28.0	31.0	28.5	24.3	25.3	26.3	

The six varieties manifested seasonal differences over the seven-year period but on the whole maintained their relative ranks. Earliana and Bestal interchanged for fifth and sixth places for all seven years. Best of All and Comet held either first or second place in six of the seven years. These two relatively high vitamin C varieties contained 30 mg. per 100 grams or more in five of the seven years. The evidence suggests a genetic superiority of certain varieties over others even under conditions unfavorable to vitamin C production as in 1938.

LOCATION: Twelve varieties of tomatoes were compared for vitamin C values when grown at Orono and in the St. John River

Valley. The tomatoes grown at Orono averaged 26.6 mg. and those from the St. John River Valley 25.0 mg. per 100 grams. The difference was not significant in the 1944 season.

FERTILIZER TREATMENT. Tomatoes have been grown in the vegetable trial garden at Aroostook Farm for the third successive year. Each of three varieties has been represented each season by 192 plants distributed among twelve fertilizer treatments. The selection F.N.C and the varieties Waltham Forcing and Bounty were grown in 1942. Bounty was found to be later maturing and relatively lower in vitamin C content than the other two varieties. Consequently it was dropped in 1943 and Best of All was substituted. This variety had been consistently higher in vitamin C and in preliminary trials appeared to be early maturing.

In 1944 composite samples of sectors from four ripe tomatoes from each of the 48 plots were analyzed for vitamin C on two different dates. On the later date (September 19) the values in milligrams per 100 grams were: F.N.C 34.6, Best of All 31.9, and Waltham Forcing 31.3 mg. per 100 grams. There were no significant differences correlated with fertilizer treatment or with liming. As the varieties were chosen for high vitamin C and for earliness, varietal differences were not significant.

Rutabaga. Two varieties of rutabaga were grown on the 48 fertilizer plots at Aroostook Farm, Presque Isle, in 1944. Samples from each plot were tested in September and again in October. Long Island Improved with 48.1 mg. per 100 grams was not significantly higher in vitamin C content than Macomber with 46.9 mg., although Long Island averaged 20 per cent and Macomber 28 per cent higher in 1944 than in 1943. There was no relation between vitamin C values and fertilizer treatment or liming. Small rutabagas tested higher than large ones, and the averages during September were higher than those during October.

STORAGE: Thirty rutabagas of Macomber and 30 of Long Island Improved were stored at two temperatures (32° and 40° F.) during the winter of 1944-45. These were tested for vitamin C in December, March, and May. At neither temperature were the losses great although the physical appearance of those stored at 32° was superior to those at 40° F.

Potato. Six varieties, Mohawk, Green Mountain, Sebago, Irish Cobbler, Chippewa, and Katahdin, were stored at five temperatures, 32°, 36°, 50°, 60°, and 70° F. This study was a continuation of

a preliminary one made during 1943-1944, except for the change of 65° to 60° F. All tubers were weighed individually when placed in storage. Samples were taken at monthly intervals for seven months for vitamin C analyses. Individual tuber weights were taken when the samples were removed from storage. Highly significant differences in vitamin C content were observed between varieties, between months, and between temperatures. Mohawk, Katahdin, and Cobbler showed higher values than the other varieties. Chippewa contained the smallest amount of vitamin C. The average value for all varieties decreased from 28.1 mg. per 100 grams to 7.4 during the seven months the potatoes were in storage. The tubers stored at 50° F. showed excellent consumer quality and the highest retention of vitamin C. This was true even when the values were calculated on the basis of the original fresh weight of the tuber. These results are in agreement with those obtained in 1943-1944. The six varieties of fresh raw potatoes, however, averaged approximately 61 per cent higher in vitamin C content in 1944 than in 1943 for the same varieties, indicating considerable seasonal variation for this character in potatoes.

FOOD PROCESSING

ASCORBIC ACID CONTENT OF VEGETABLES AS DETERMINED BY VARIETY AND METHOD OF PROCESSING. Mary M. Clayton, Beulah O. Wells, and Celia Goos. Studies have been made on the following vegetables which were raised by the Department of Horticulture at Orono: tomatoes, rutabagas, spinach, turnip greens, kale, and cabbage.

Tomato. Losses of vitamin C during canning and storage were studied in 18 varieties, which included most of those which had been found by Murphy¹ to be high in vitamin C and some others which are of special interest from the standpoint of early ripening or as possibilities for the market. The following varieties were included, listed in the order of the average raw values (highest first) obtained for vitamin C on the tomatoes as prepared for canning (skins removed): Best of All, Early Trellis, Farthest North C, Comet, Burpee's #5500, Master Marglobe, P. S. Earliana, Valliant, Orange

¹ The vitamin C content of Maine foods. Elizabeth F. Murphy. Me. Agr. Exp. Sta. Bul. 426, pp. 301-302, 1944.

King, Burpee's #2200, Waltham, Coventry, Trellis 22, Early Chatham, New Hampshire Victor, Bonny Best, Pritchard, and Stokesdale. With the exception of the Farthest North C variety and the last five in the above list, all varieties were pruned and staked.

The tomatoes were canned by the hot pack method in both tin and glass. The tin cans were stored at room temperature and the glass jars at both room and cellar (approximately 60° F.) temperatures. Vitamin C analyses were made on the fresh tomatoes at the time of processing and on the canned product the day after canning and at periods of four months and eight months later. The results of the analyses are given in Table 67.

Vitamin C values were much higher for the tomatoes canned in tin than for those in glass. Storage temperature was not found to affect appreciably the vitamin C content of the tomatoes in glass. In the tomatoes canned in tin, most of the loss of vitamin C occurred during the first four months of storage. For those canned in glass the greatest loss occurred during the first four months, but there was also a significant loss during the last four months. The highest percentage losses at the end of eight months, for those canned in glass, were found in the varieties which were grown on the ground. The reason for this cannot be explained at present but the effect of staking and not staking on the vitamin C content of the raw tomatoes and on the percentage losses during canning will be studied further during the coming year. Of the four varieties which had the highest raw values for vitamin C the following three had the highest canned values (when canned in both tin and glass): Best of All, Early Trellis, and Comet.

Of the three varieties which had the highest canned values, the Comet tomatoes were to be preferred for both size and quality. The Best of All tomatoes had a tendency to crack at the sides and to ripen unevenly.

Rutabaga. A comparison was made of the cooking losses in two varieties of rutabaga, Long Island Improved and Bangholm Swedes. In this comparison the rutabagas were cut in $\frac{3}{4}$ inch cubes, steamed 20 minutes (in a steamer with holes in the sides but not in the bottom), and mashed. The few drops of liquid in the steamer were left in with the solids.

The average vitamin C value for the raw product was 37.9 mg. per 100 grams for the Long Island Improved variety and 45.1 mg.

TABLE 67
Varietal Differences in Loss of Vitamin C in Tomatoes During Canning and Storage—Effect of Type of Container

Variety	No. of batches	Raw values ³	Canned value in milligrams per one hundred grams and per cent lost from raw equivalent value									
			Tin—Averages for cans stored at room temperature					Glass—Averages for jars stored at room and cellar (50° F.) temperatures				
			Test ²					Test ²				
			1 - 1 day	2 - 120 days	3 - 240 days	1 - 1 day	2 - 120 days	3 - 240 days	1 - 1 day	2 - 120 days	3 - 240 days	1 - 1 day
		Mg/100 gms.	Mg	% lost	Mg	% lost	Mg	% lost	Mg	% lost	Mg	% lost
Best of All	2	31.7	31.0	4.1	30.2	6.6	29.5	8.7	31.2(1)	3.0(1)	25.2	21.8
Early Trellis	2	30.7	29.8	3.0	27.0	9.9	27.6	11.1	28.7	7.5	22.4	27.9
Farthest North C ¹	2	29.0	25.4	13.9	22.7(1)	27.7(1)	23.3	21.3	24.4	17.4	18.0	40.3
Comet	2	28.8	27.6	6.7	25.6	10.2	25.1	15.2	27.5	7.2	19.9	32.8
Burpee's #5500	1	27.3	26.6	10.7	—	—	25.8	13.4	—	—	—	—
Master Marglobe	2	26.3	24.5	7.5	23.5	11.1	23.3	14.0	23.3	11.9	17.8	33.2
P.S. Earliana	2	26.3	24.3	9.1	25.3(1)	8.0(1)	22.4	16.2	24.7	7.6	18.8	30.6
Vallant	1	26.1	24.9	11.1	23.5	16.3	22.8	18.8	—	—	—	—
Orange King	1	25.4	24.3	7.1	23.2	11.2	22.6	13.5	—	—	—	—
Burpee's #2900	1	25.1	24.6	3.1	23.2	9.8	21.8	15.2	—	—	—	—
Waltham	2	24.1	24.6	4.9	23.0	—	22.9	7.7	23.4	3.8	16.3	33.3
Coventry	2	23.8	23.7	4.2	23.4(2)	2.0(2)	22.5(2)	3.2(2)	23.1	5.3	16.2	32.7
Trellis 22	3	23.2	21.8	6.6	21.0	6.2	20.3	13.1	21.4	8.6	15.4	34.3
Early Chatham ¹	1	19.6	20.3	.7	18.9	7.3	17.9	12.6	—	—	—	—
N.H. Victor ¹	1	18.6	18.5	3.1	17.7	7.2	17.4	8.8	—	—	—	—
Bonny Best ¹	2	17.9	16.2	10.1	16.0	11.2	16.0	11.6	14.9	17.8	10.2	44.5
Pritchard ¹	2	17.4	14.7	15.9	14.1	19.4	13.2	24.0	13.9	20.2	8.6	52.1
Stokesdale ¹	2	16.7	15.7	7.7	14.1(1)	13.8(1)	14.1	17.3	14.8	12.8	8.7	48.8

¹ Not stacked. All other varieties pruned and stacked.

² Numbers in parentheses indicate number of batches tested.

³ With skins removed as prepared for canning.

per 100 grams for the Bangholm Swedes. The average cooked value for the Long Island Improved was 30.0 mg. and for the Bangholm Swedes 37.1 mg. However, the larger size and better quality of the Long Island rutabagas made them preferable to the other variety.

Additional cooking tests made on the Long Island rutabagas gave results similar to those secured on this variety last year.² The following comparative values were obtained for the solids cooked in various ways when all results were based on the average raw value of 37.9 mg. per 100 grams.

	Mg./100 gms.
1. Boiled 20 min. in a small amount of water and mashed ($\frac{3}{4}$ inch cubes)	32.4
2. Steamed 20 min. and mashed ($\frac{3}{4}$ inch cubes)	31.3
3. Boiled 20 min. in a small amount of water ($\frac{3}{4}$ inch cubes)	30.9
4. Baked in a casserole 50 min. at 400° F. with a small amount of fat—no water ($\frac{3}{4}$ inch cubes)	30.4
5. Wedges (40 gm.) boiled 35 min. in a moderate amount of water and mashed	24.1

These results indicate that rutabagas are a very good source of vitamin C when cooked by any one of the first four methods given above.

Spinach. Losses of vitamin C during canning and storage were studied in three varieties of spinach, Nobel, Viking, and Long Standing Bloomsdale. The spinach was canned in both tin and glass by the hot pack method, using the procedure previously described.² The tin cans were stored at room temperature and the glass jars at both room and cellar (60° F.) temperatures. Vitamin

² Ascorbic acid content of vegetables as determined by variety and method of processing. M. M. Clayton, B. O. Wells, C. Goos, and E. F. Murphy. Me. Agr. Exp. Sta. Bul. 426, pp. 306-311, 1944.

C tests were made on the raw spinach and on the canned product the day after canning and after storage for periods of four months and eight months.

The following average raw values in milligrams per 100 grams were secured for the three varieties: Viking 66.1, Long Standing Bloomsdale 62.5, and Nobel 59.1. The raw values secured for the Nobel variety were somewhat lower this year than last. (The Viking and Long Standing Bloomsdale varieties were not tested last year.)

Losses during canning were approximately 10 per cent higher this year than last, although the same method was used. When canned in tin the Nobel and Viking varieties lost approximately 50 per cent of their vitamin C while the Long Standing Bloomsdale variety lost about 60 per cent. There was no further loss during eight months of storage at room temperature in any of the varieties.

When canned in glass the initial losses were about the same as when canned in tin but there was a slight additional loss in the glass jars stored at room and cellar (60° F.) temperatures.

The average vitamin C values obtained for the three varieties of spinach after canning and storage are given in Table 68.

Turnip greens. Vitamin C losses during canning and storage were studied in two varieties of turnip greens, Shogoin and Purple Top White Globe. The methods used for canning and storage were the same as for spinach.

The average raw values in milligrams per 100 grams secured for the two varieties were as follows: Shogoin 94.1 and Purple Top White Globe 91.2.

During canning in tin the Shogoin variety lost about 63 per cent of its vitamin C and the Purple Top variety about 53 per cent. During eight months of storage at room temperature there was no further loss in the Shogoin greens but the Purple Top variety lost an additional 7 per cent of the vitamin. This made the final vitamin C values about the same for the two varieties.

Only the Purple Top variety was canned in glass. During canning these greens lost about 64 per cent of their vitamin C (partly due to loss of liquid from the jars). During eight months of storage at room and cellar (60° F.) temperatures the jars held at room temperature showed a slight additional loss but those in the cellar showed very little change.

TABLE 63
Varietal Differences in Average Loss of Vitamin C in Spinach and Turnip Greens During Canning and Storage—1944

Test	Spinach Nobel			Spinach Viking			Spinach Long Standing Bloomsdale			Turnip Greens Shogoin			Turnip Greens Pur. Top Wh. Globe		
	2 batches—canned in tin. Stored at room temperature			2 batches—canned in tin. Stored at room temperature			2 batches—canned in tin. Stored at room temperature			1 batch—canned in tin. Stored at room temperature			2 batches—canned in tin. Stored at room temperature		
	Vit. C Mg/100 gms. (59.1)	Liq.	% loss ¹	Vit. C Mg/100 gms. (66.1)	Liq.	% loss ¹	Vit. C Mg/100 gms. (62.5)	Liq.	% loss ¹	Vit. C Mg/100 gms. (94.1)	Liq.	% loss ¹	Vit. C Mg/100 gms. (91.2)	Liq.	% loss ¹
1-Day after canning	22.2	25.4	51.9	23.0	27.2	55.3	18.3	21.6	61.8	26.9	33.0	62.6	33.2	38.7	53.3
2-120 days ²	21.8	25.1	62.1	26.5	30.0	49.3	18.6	21.3	61.8	29.5	34.7	59.9	31.3	38.0	55.2
3-240 days ²	24.0	26.0	49.2	24.5	27.9	52.2	18.5	21.0	62.3	26.7	31.8	62.4	27.9	34.1	50.3
Raw	2 batches—canned in glass. Stored at room temperature			2 batches—canned in glass. Stored at room temperature			2 batches—canned in glass. Stored at room temperature			None canned in glass			2 batches—canned in glass. Stored at room temperature		
1-Day after canning	24.6	25.9	53.6	27.0	31.0	52.3	20.7	25.8	61.5				35.0	39.2	60.6
2-120 days ²	21.8	25.5	55.6	27.4	32.0	57.9	17.6	20.6	67.4				31.8	36.6	65.1
3-240 days ²	22.6	25.9	54.5	26.1	29.7	54.6	19.3	22.1	64.2 ³				28.4	31.8	67.5
Raw	2 batches. Canned in glass. Stored at cellar temperature			2 batches—canned in glass. Stored at cellar temperature			2 batches—canned in glass. Stored at cellar temperature			None canned in glass			1 batch—canned in glass. Stored at cellar temperature		
1-Day after canning	25.5	27.2	54.2	26.2	29.4	52.8	19.7	22.3	63.6				38.2	41.8	68.0
2-120 days ²	22.3	25.4	57.1	20.8	23.5	64.5 ³	19.6	22.0	62.7				27.4	30.6	71.2
3-240 days ²	24.7	27.1	55.0	23.4	25.6	59.3	17.6	19.5	66.7				27.4	29.5	69.5

¹ From raw equivalent value. The percentage was obtained by comparison of the vitamin C content of 1 can (or jar) of solids and liquid with that of the equivalent amount of raw greens (stems removed).

² Days indicate length of time from Test 1.

³ 1 batch.

The average vitamin C values obtained for the two varieties of turnip greens after canning and storage are given in Table 68.

There was considerable difference in the texture of these two varieties of turnip greens, both before and after canning. The Shogoin greens had a smooth leaf while the others were somewhat hairy. However, the flavor was good in both, especially when they were reheated with a little salt pork or bacon fat. It was noted that the vitamin C content of the raw greens increased as the leaves grew larger.

Kale. The two varieties of kale studied were Green Curled Scotch and Dwarf Siberian. Vitamin C losses were determined after steaming 13 minutes and after making into individual salads with French dressing. The salads were held at room temperature for varying lengths of time.

The following average results were obtained for the two varieties:

STEAMED KALE

Variety	No. tests	Vit. C Av. raw value mg/100 gms.	Vit. C steamed mg/100 gms.	Per cent loss*
Dwarf Green				
Curled Scotch	5	216.9	164.4	18.9
Dwarf Siberian	5	149.0	97.3	29.8

KALE SALADS—FRENCH DRESSING† Held at room temp.

Variety	No. tests	Vit. C Av. raw value mg/100 gms.	Time min.	Vit. C salads mg/100 gms of kale	Per cent loss*
Dwarf Green					
Curled Scotch	5	214.9	0	213.4	.8
			15	200.0	7.2
			30	195.5	9.2
			60	175.3	18.6

* From raw equivalent values.

† Made with cider vinegar adjusted to 5 per cent acidity.

Dwarf Siberian 5	160.5	0	164.7	+2.7 (gain)
		15	156.3	2.4
		30	148.1	7.7
		60	133.9	16.4

These results indicate that the rate of vitamin C loss during steaming was lower for the Dwarf Green Curled Scotch variety than for the Dwarf Siberian. Also the appearance and flavor of the Green Curled Scotch variety was better. The varietal difference in vitamin C loss was not apparent in the kale salads.

The Green Curled Scotch variety kept best through the winter. In early December this variety when tested raw averaged 179.5 mg. vitamin C per 100 gms. The leaves were frozen hard when picked. In April the same variety averaged 182.2 mg. per 100 gms.

Cabbage. Vitamin C losses were studied in individual cabbage salads made from two varieties of late cabbage, Penn State Ballhead and Danish Ballhead.³

In the preparation of the salads the cabbage was shredded with a stainless steel knife, combined with mayonnaise, cooked dressing, or French dressing, and kept for varying lengths of time at refrigerator and room temperatures. The results showed no consistent differences in the raw vitamin C values for the two varieties. Marked variations occurred within each variety and the vitamin C decreased with the length of time in storage.

There were also no consistent differences in the percentage losses in the cabbage salads made from the two varieties of cabbage. At refrigerator temperatures (42-46° F.) there was no loss in vitamin C in 24 hours in the salads made with cooked dressing. In the salads made with mayonnaise the losses averaged only 2.7 per cent at the end of one hour, 4.0 per cent at the end of four hours, and 19.0 per cent at the end of 24 hours.

At room temperature there was very little difference in the vitamin C losses in the salads made with mayonnaise and cooked dressing during the first hour. At the end of two hours there was a slightly higher loss in the salads made with mayonnaise. The average loss (both dressings) at the end of one-half hour was 4.4 per cent and at the end of one hour 5.0 per cent; at the end of two

³ The cabbage was held in cold storage at 34° F. until used for testing.

hours it was 8.4 per cent with mayonnaise and 5.1 per cent with cooked dressing.

The vitamin C losses in the salads made with French dressing and held at room temperature were considerably higher than in those made with mayonnaise and cooked dressing. For example, the average loss for salads made with French dressing was 11.2 per cent after one-half hour, 16.3 per cent after one hour, and 27.4 per cent after two hours.

The salad dressings all contained cider vinegar which was supposedly diluted to 5 per cent acidity. However, at the end of this series of experiments it was found that the acidity of the vinegar had decreased so that it was being diluted to 3.6 per cent. This low acidity of the vinegar may partly account for the low losses in the salads made with mayonnaise and cooked dressing and held at room temperature.

EFFECT OF VINEGAR ON THE LOSS OF VITAMIN C IN CABBAGE SALADS. Mary M. Clayton and Celia Goos. Previous work on vitamin C losses in cabbage salads⁴ made with finely chopped cabbage (put through a meat chopper) and mayonnaise containing vinegar or lemon juice suggested that loss of the vitamin was in some way related to the presence of acid in the dressing. Since the results of the studies reported in the previous section also seemed to indicate that the rate of loss was related to the proportion of vinegar to other ingredients in the dressing, it seemed desirable to carry out a series of experiments which would give information regarding the effect of different kinds and strengths of vinegars on vitamin C losses in cabbage salads.

In this study new cabbage was made into individual salads with French dressing containing several different kinds of vinegar of 3 and 5 per cent acidity, or 3 and 5 per cent acetic acid or water. Salads were also made using plain vinegars in the two strengths. Vitamin C losses in the salads were determined after holding them for different lengths of time at room temperature. The results may be summarized as follows:

1. There was very little difference in the effect of the different kinds of vinegar, whether used plain or in French dressing.

⁴ The effect of sodium chloride and vinegars on the oxidation of ascorbic acid (vitamin C). Mary M. Clayton. Me. Agr. Exp. Sta. Bul. 400, pp. 231-235, 1940.

2. Acetic acid used in the same strength as the acid in the vinegars caused about the same percentage loss of vitamin C in the cabbage.
3. French dressing made with 5 per cent vinegars caused an average loss in vitamin C of 34.9 per cent in two hours. The dressing made with 3 per cent vinegars caused an average loss of 21.7 per cent. That made with water caused a loss of only .8 per cent in two hours.
4. Plain vinegars used in the same amounts as were used in French dressing caused greater losses of vitamin C.
5. French dressing made with water or water alone instead of vinegar caused no loss of vitamin C in two hours. There was also no loss of vitamin C from the plain shredded raw cabbage in this length of time.

These results seem to indicate that the acid in the vinegars liberates certain metallic ions which catalyze the oxidation of the vitamin C in the cabbage. In order to avoid this, salads should be mixed with French dressing shortly before they are to be eaten.

USE OF A SIMPLE OXIDATION TEST FOR PREDICTING VITAMIN C LOSSES IN VEGETABLES DURING PROCESSING. Mary M. Clayton and Celia Goos. This test⁵ involves the use of an extract of the raw vegetable in glass distilled water. A definite amount of pure crystalline vitamin C (or vitamin C plus a trace of copper) is added to a measured amount of the vegetable extract and the percentage loss of the vitamin is determined at definite time intervals (up to three hours) after mixing with the crystals. The flasks containing the extract are kept in a constant temperature incubator at 42° C.

A comparison of average vitamin C losses (with and without copper) in extracts of different vegetables showed a striking difference in the vitamin C oxidation rate in different kinds of vegetables. The lowest rates occurred in spinach and tomatoes and the highest in Swiss chard and tampala. Differences in rate also occurred between certain varieties of the same vegetable. The vitamin C losses which occurred during the canning of chard, spinach, turnip greens,

⁵ For a complete description of the procedure for carrying out the test see: A Simple Oxidation Test for Use in Predicting the Tendency for a Vegetable to Lose Vitamin C During Processing. Mary M. Clayton and Celia Goos. Prog. Notes. Nat. Coop. Prog. Me. Agr. Exp. Sta. June, 1945.

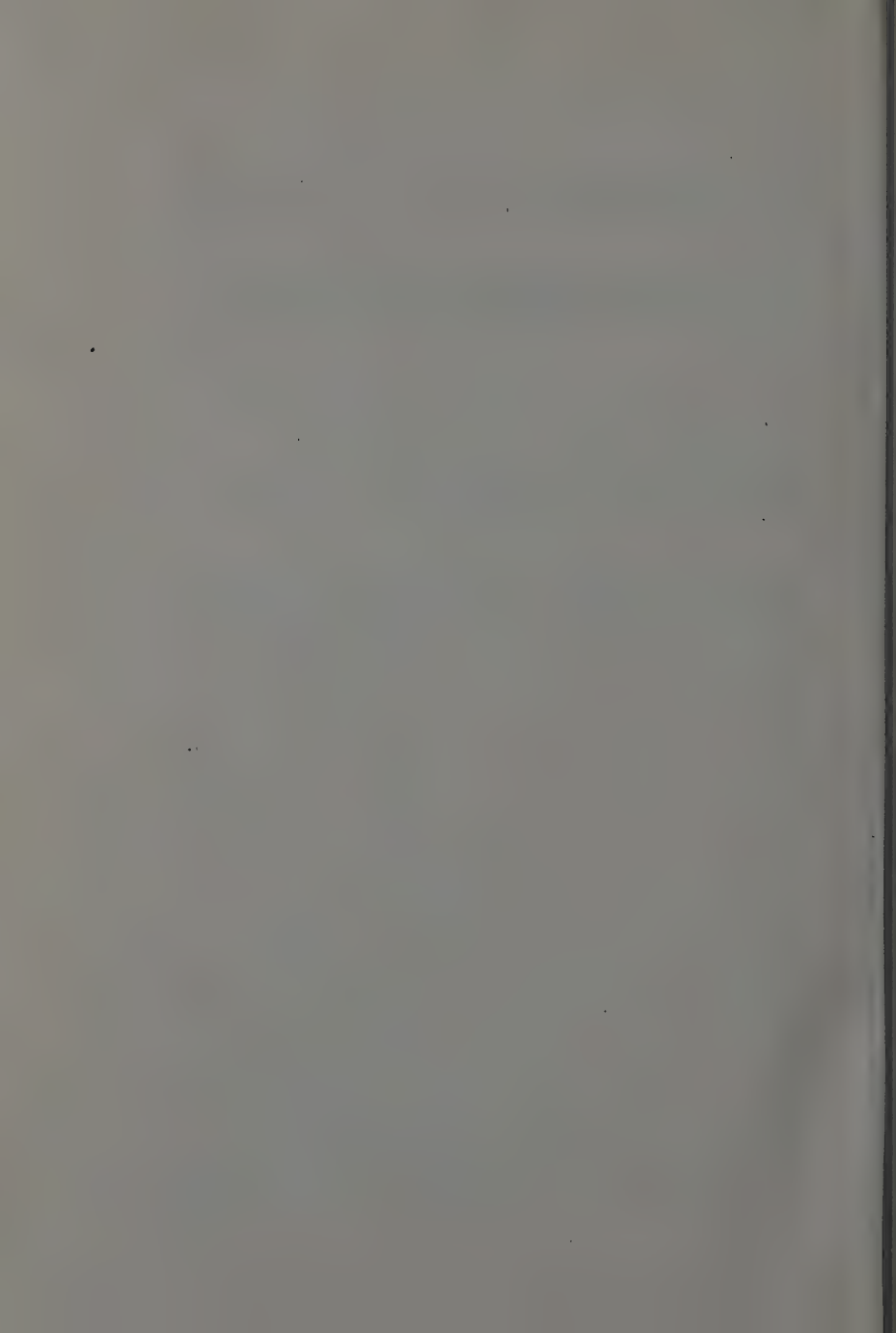
and tomatoes were found to be roughly comparable to the results obtained in the oxidation tests.

RECENT PUBLICATIONS OF INTEREST IN FOODS AND NUTRITION

BULLETINS

- 426. Reprint on Foods and Nutrition. Annual Progress Report for Year Ending June 1944.
- 428. Composition and Uses of Blueberries.
- 430. Four-Year Study of the Food Habits and Physical Condition of Grade-School Children in Newport, Maine.
- 433. Kerosene Burners in a Wood Cookstove.

Further information on any of the studies in progress may be obtained by writing to the individuals conducting the work. Any of the bulletins of the Station are mailed free upon request.



DAIRYING

During the war, the dairy research program was intensified in order to obtain more information as to methods of obtaining maximum production and increased efficiency both in production and marketing of dairy products. These projects include economic studies of more efficient use of labor, adjusting seasonal milk production, and the importance of every-other-day delivery of milk and other wartime distribution practices.

Studies of pasture improvement have been continued to determine the most economical use of fertilizer in the production of roughage. Emphasis also has been given to the improvement in the quality of dairy roughage and the effect on the carotene content and feeding value of grasses and clovers when dried or ensiled. The practicability of a barn hay drier as a supplement to field curing of hay is being tested at Highmoor Farm.

The possibility of reducing labor and building requirements by keeping dairy heifers during the winter in a shed with yard is being studied.

Disease control work has been started during the past year with projects relating to Bang's Disease and Mastitis control. Problems of breeding efficiency in artificial insemination also are being studied.

A simple procedure for producing homemade cheese has been developed. Work also has been done on preventing mold growth on cheese, and in checking the results of a new method for testing butterfat in ice cream.

The results of the dairy research work for 1944-45 are summarized by projects.

EFFICIENCY IN USE OF LABOR ON DAIRY FARMS.¹ George F. Dow. The economical use of labor is one of the most essential requirements for increased returns on Maine dairy farms. Labor efficiency has been relatively low on many farms because of the small size of the farm business, low rates of crop and livestock production, and insufficient labor saving equipment. Prewar surveys including 989 dairy farms showed an average of only 5.8 cows per man, with a total of only 215 man work units per man. The

¹ More details are available in Bul. 436, Use of Labor on Maine Farms With Dairy Cows.

latter figure indicates that the productive work accomplished by an able-bodied man under normal conditions was equivalent to only 215 ten-hour days during the year. The most efficient dairymen in this study, using approximately the same amount of labor per farm, kept an average of 14.4 cows per farm as compared with only 6.6 cows for the least efficient dairymen. The labor income per farm averaged +\$394 for the efficient group in contrast to a loss of \$406 for the inefficient group. During years of reasonably good prices, as in 1928 to 1937, the variations in labor efficiency on small farms caused labor income per farm to vary from an average of -\$194 to +\$90; and on the large farms accounted for a variation from -\$279 to +\$919.

The size of the farm business had an important influence upon labor efficiency. The farmers with a large business used only 3.1 hours of labor per cwt. of milk in contrast to 5.0 hours for those with a small farm business. The net cost of milk production on the large farms was decreased 32 cents per cwt., and labor income per farm was \$834 higher than on the small farms.

In spite of the importance of size of farm business, it is more profitable to operate a small farm with as efficient use of labor as possible than to have a large farm on which labor is used inefficiently. During 1928 and 1937, the efficient dairymen on small farms received an average labor income of +\$90 per farm, whereas the inefficient producers on the large farms lost an average of \$279 per farm. However, the farms that give the greatest returns are those that have both a large farm business and high labor efficiency. During 1928 and 1937, the farms having high labor efficiency yielded an average labor income of +\$90 per small farm, +\$274 per medium size farm, and +\$919 per large farm.

The farmers with the highest crop yields and largest milk production per cow produced 70 per cent more food per man than did those with the lowest production rates. The most productive farmers had a labor income of +\$330 per farm as compared with -\$305 for those that were least productive.

Milking machines, buckrakes, and watering cups were some of the types of equipment that resulted in more efficient use of labor.

In the postwar period, more emphasis will be given to the increased use of machinery and additional output per man. This trend is developing rapidly as a result of increased farm wage

rates. In 1944, monthly wage rates with board averaged \$13 per month higher than in 1943, \$53 higher than in 1940, and \$61 higher than in 1933. The 1944 rate was \$28 higher than the peak reached in 1920 following the First World War.



FIG. 1. Many Farmers, Who Formerly Loaded Hay by Hand, Now Are Turning to Labor Saving Equipment Such as Hayloaders, Buckrakes, or Field Hay Balers.

The farmers who supplemented dairying with some other farm business had a more efficient use of labor and larger labor incomes than did those specializing in wholesale milk production.

The farm operators who were 65 or more years of age had an average of only 186 man work units per man on their farms as compared with 236 units on farms where the operators were less than 40 years of age. The younger operators had an average labor income that was \$385 per farm more than that for the older operators.

IMPORTANCE OF CONTINUING EVERY-OTHER-DAY DELIVERY.²

George F. Dow. Wartime practices, including every-other-day delivery of milk, have resulted in a marked increase in the efficiency of milk distribution. A study has been made, based on data for

² More details are available in Bul. 437, Size of Loads and Delivery Costs for Labor in Milk Distribution in Boston and Portland.

October 1944 as compared with October 1941, including distributors who handle 90 per cent of the fluid milk sales in Portland and two-thirds of the sales in Boston. Every-other-day delivery and other wartime practices, along with an increase in milk consumption, have increased the volume of retail deliveries per man by 34 per cent in both Boston and Portland. On wholesale routes, the labor efficiency was increased 4 per cent at Boston and 35 per cent at Portland. There were also some savings made in motor truck costs as a result of every-other-day delivery and the elimination of callbacks and special deliveries.

This increase in the efficiency of the use of delivery labor was nearly sufficient to offset the substantial increase in wage rates paid deliverymen. This was important in view of the fact that wage rates paid retail route drivers increased 38 per cent at Boston and 44 per cent at Portland. The result was a net increase in delivery labor costs, per point of product handled, of only 4 per cent for the retail routes at Boston and 7 per cent at Portland. For wholesale routes, the net increase in delivery labor costs was only 11 per cent at Boston and 1 per cent at Portland.

Wage rates will not decrease appreciably, at least for some time, even though the war has ended. Consequently if there is a return to daily delivery and other prewar practices, resulting in labor efficiency and size of loads as low as in October 1941, there will be an increase in delivery costs. The extent to which delivery costs would increase also would depend to some extent upon the trend in per capita milk consumption. However, the increase in labor costs on retail routes, under existing wage rates, would amount to 0.89 cent per quart of milk in Boston and 0.74 cent in Portland if size of loads and labor efficiency should decrease to prewar levels. Motor truck costs on retail routes also would be increased, resulting in an additional cost of 0.2 cent per quart of milk. The combined effect on labor and motor truck costs would be an increase of at least 1 cent per quart of milk.

Many milk distributors are in favor of continuing the practice of every-other-day delivery and some of the other more practical wartime procedures. Consumers in general have accepted readily the every-other-day delivery of milk, and presumably will be willing to continue this practice if they are assured of saving at least 1 cent per quart. Farmers also have an interest in efficient distribution because of its importance in stimulating increased milk

consumption and in maintaining satisfactory milk prices. In the next few years, new and improved substitute dairy products from the Midwest may furnish additional competition to northeastern fluid milk and cream. The fluid milk industry also faces the post-war problem of absorbing subsidy payments on milk which have amounted to about 1 cent per quart during the summer and nearly 2 cents per quart during the winter. Because of these factors it is important for the fluid milk industry of the Northeast to make and continue in effect all practical economies in the production and distribution of milk.

BUTTERFAT DIFFERENTIAL PAID PRODUCERS FOR MILK. George F. Dow. The amount of premium, or deduction, paid producers for milk of various butterfat content is an important factor in the consideration of fair and equitable milk prices. If the differential is too high, or too low, an undesirable change may occur in the average test of milk delivered by producers, due to a gradual change in the breeds of cows kept.

For the Boston market the butterfat differential has been flexible since 1920 varying monthly according to a formula based on quoted prices for butter or cream. In this way, dealers pay for additional butterfat on the general basis of its value if used for butter or cream. The producer's premium for high test milk (or deduction for low test milk) also varies fairly closely in line with changes in the price for milk, thereby reducing the tendency for changing breeds.

The variations that have occurred in the butterfat differential for the Boston market since 1920 are shown in Table 69, along with the comparative price for milk. The differential from 1930-34 for each change of one tenth in the test of milk averaged 2.8 cents; increased during 1935-39 to an average of 3.5 cents; in 1940-42 averaged 4.6 cents; and in 1943-44 was 6.6 cents. The extremes in the variation since 1920 were from a low of 2.2 cents in 1932-33 when prices of dairy products were extremely low, to a peak of 6.7 cents for 1944 when prices were high. Although such a variation seems rather large, the butterfat differential has tended to vary in line with changes in the price for milk. Consequently the differential has been kept fairly uniform when expressed as a percentage of the blended price for milk. In 1920-29 the differential averaged 1.8 per cent of the base price, in 1930-34 was 1.5 per cent, in 1935-39 was 1.8 per cent, in 1940-42 was 2.0

per cent, and in 1943-44 was 1.8 per cent. The average for the 24-year period since 1920 was 4.2 cents which was 1.8 per cent of the blended price for milk.

TABLE 69

*Average Annual Milk Prices and Butterfat Differentials
Paid Boston Producers 1920-44¹*

Year	Blended price per cwt. milk ²	Butterfat differential in cents ³	Differential as per cent of price
1920-24	\$2.63	4.7	1.8
1925-29	2.58	4.6	1.8
1930-34	1.83	2.8	1.5
1935-39	1.93	3.5	1.8
1940-42	2.29	4.6	2.0
1943-44	3.66 ⁴	6.6	1.8
Av. 1920-44	\$2.36	4.2	1.8

¹ Information received from monthly reports of C. W. Swonger of the N. E. Milk Producers Assn., and S. W. Tator, Milk Market Administrator, Boston, Mass.

² Prices per cwt. of 3.7 per cent milk delivered to country plants in 200-mile zone.

³ Differential in cwt. price of milk for each one-tenth variation in butterfat test above or below 3.7 per cent.

⁴ Includes subsidy payments since October 1, 1943. If subsidy is omitted, the average price for 1943-44 would be \$3.31, and the differential would be 2.0 per cent.

An increase in the butterfat test of milk adds to its food value but requires additional feed input and adds to the costs of milk production per cwt. of milk. The variation in energy content and feed cost of production is approximately 1.6 per cent for each change of one-tenth in the butterfat test of milk³. Therefore, if the differential is about 1.6 per cent of the base price for milk, the price for milk of different tests is adjusted in line with the energy content of the milk. The differentials computed under the Boston formula are fairly closely in line with the 1.6 per cent ratio which is based on the energy content of milk. As already discussed, the differential for Boston averaged 1.8 per cent for 1920-44, or slightly more than warranted on the basis of energy content.

The real test of the adequacy of the butterfat differential paid producers is whether producers have maintained the butterfat content of milk at the desired level. Since 1940, accurate statistics

³ Gaines, W. L. A Price Differential for Whole Milk, Based on Fat Test and Feed Cost of Production. Illinois Agr. Exp. Sta. Cir. 318, p. 5, 1927.

are available from the Boston milk market administrator's office to show the trend in the butterfat content of milk.

These tests are as follows:

YEAR	ENTIRE MILKSHED	MAINE PRODUCERS
1940	4.00	4.21
1941	3.98	4.21
1942	4.02	4.22
1943	4.04	4.24
1944	4.02	4.22

These figures indicate that the butterfat test of milk during recent years has been stabilized with only relatively small changes.

The trend over an earlier period of years is indicated by studies made by the Experiment Station. In 1928, the average test of milk delivered at Maine plants of Boston dealers was 4.14 per cent as compared with 4.18 per cent in 1939. This change is exceedingly small, and does not indicate any significant trend in view of the shift of producers from cream to milk deliveries.

On the basis of past experience, it seems evident that the differentials computed under the Boston formula have been satisfactory and adequate in maintaining a fairly uniform butterfat content of the milk supply in New England. These differentials tend to equal approximately 1.8 per cent of the producer's blended price for 3.7 per cent milk, and also coincide rather closely with the variations in the energy content of milk of different tests.

SEASONAL VARIATION OF MILK PRODUCTION. George F. Dow. The production of milk shows a large seasonal variation, reaching a peak during May and June and a low point in November and December. Milk deliveries per producer supplying Boston dealers averaged 337 pounds daily in June 1943 as compared with only 179 pounds daily in November 1943. Milk consumption, on the other hand, tends to remain relatively constant throughout the year, resulting in large quantities of surplus milk in New England during the spring and early summer months. The use of milk in November 1943 was 92.8 per cent for fluid milk, but in June was only 45.7 per cent.

If milk production had been more even, producers would have received a higher blended price due to the sale of more fluid milk, more cream in place of butter and cheese, and more skim milk as

powder instead of casein. Another disadvantage of uneven production is the tendency for Boston dealers to expand their milkshed into other market areas in order to obtain sufficient milk to meet demand in the months of short production. For the remainder of the year, the additional supply of milk from these new areas is not needed as fluid milk, and merely adds to the amount of surplus in the market.

One of the most uneconomical results of uneven milk production is the necessity for extra trucks, milk plant capacity, equipment and labor for handling the peak volume of production in May and June. During the remainder of the year, as milk production decreases, there are unused facilities in excess of requirements, with resulting inefficiency and increased marketing costs for milk trucking and operation of milk plants. The importance of this problem is emphasized when one realizes that June production is nearly twice as large as that of November, and the trend in recent years has been for more uneven production.

One of the most important reasons for uneven milk production has been the lack of sufficient price premium for November and December milk, or too small a price discount for milk produced in May and June.

During 1944 and 1945, this situation was corrected in part by subsidy payments which were 35 cents per cwt. higher in the fall than in May and June. Several alternative price methods may be followed in encouraging more even production of milk in the post-war period when subsidies are discontinued. One method is the base rating plan which was effective in the Boston market during 1930 to 1937 and was instrumental in causing some reduction in seasonal variation. Base ratings as set up and administered were complicated, difficult for farmers to understand, and caused much dissatisfaction among producers and dealers. Another plan is to withhold some of the producers' milk price during the months of heavy production, and thereby establish a pool to be distributed as an extra price premium on milk produced during the months of short production. This plan would not attempt to cause all farmers to even out their production of milk throughout the year, but would encourage some farmers to produce a maximum volume during the months when more milk is needed. Another procedure yielding rather similar results, but perhaps more likely to receive producer approval, would be to provide for a regular seasonal adjustment

in the Class I price, with a decrease in the spring and an increase in the fall. This would provide for a substantial premium for milk produced during the winter period and lower returns during May and June. The chief disadvantage of the seasonal change in Class I price to producers would be a corresponding seasonal change in the consumers' price. If such changes, however, were explained to consumers, it is believed that a regular seasonal change of this nature would not be objectionable.

In selecting the most satisfactory type of price plan, it seemed desirable to obtain information for individual dairymen as to the problems of seasonal variation of production. Accordingly, figures were obtained from the Boston milk administrator's office for 450 dairymen, over the five-year period of 1939-43. Also, 150 of these dairymen were interviewed in a special survey.

Only about one-fifth of the herds produced as much or more milk in November and December as in May and June. This proportion had decreased in recent years from 23 per cent in 1939-40 to 17 per cent in 1943. Thirteen per cent of the herds in 1943 had very uneven production with the volume in November and December averaging less than two cans of milk for every five cans produced in May and June.

There was no appreciable relationship between size of herd and the amount of seasonal variation. The season of the year when cows and heifers freshen had a very important effect on the seasonal variation of milk production. Cows and heifers that freshened during July to September tended to even out the milk supply by being in full production during November and December, and being nearly dry during May and June when there is an excess supply of milk. A large proportion of cows freshening during October to December did not help to even out seasonal production because these cows started milking too late to give much boost to the November-December milk supply.

A wide variation in milk production occurred in many individual herds during the five-year period 1939-43. This variation was the result of two major factors. One was the annual fluctuation caused by temporary short-time changes due to breeding troubles, disease problems, feed conditions, turnover in cows as heifers freshen and cows are sold, and other management changes affecting the herd. The other was a long-time change of a more permanent nature, resulting from an expansion in milk production by keeping

more or better cows, or from a contraction by others because of old age or ill health of the operator and other factors.

The smaller herds *individually* have a considerably greater amount of variation from year to year, even though the *average* for the group is about the same as for the larger herds. Consequently, even though seasonal production may be more uniform in Maine than in some other states with larger herds, the Maine dairymen *individually* might have greater difficulty in meeting the stringent requirements of uniform production quotas under a base rating price plan.

Consideration also was given to the price premium which dairymen should receive in the fall, as compared with the spring, in order to encourage a more even production of milk. The average of dairymen's estimates of an adequate seasonal premium was 89 cents per hundredweight.

PASTURE FERTILIZATION AND SEEDING. Charles H. Moran, Joseph A. Chucka, Bernie E. Plummer, Jr. The fertility studies with pastures were continued at Highmoor Farm. The yields per acre in 1944 were somewhat lower than in previous years due to the lack of moisture during critical periods. The low moisture materially hastened the maturity of the grasses and the clovers. Orchard grass which would normally be in bloom by mid-June was in the late blossom stage on June 5.

In 1941 several of the paddocks were split into A and B halves, with the B portion of each paddock receiving only one half as much plant food as the A portion. The results of the treatments for the last four years are compiled in Table 70.

The additional fertilizer applied to the A sections has given greater yields per acre from all paddocks, except for native pasture treated solely with manure and P_2O_5 (Paddocks 9A and B). An increase from 50 to 100 pounds each of P_2O_5 and K_2O resulted in a 13 per cent increase in yield (Paddocks 6A and B). When a complete fertilizer was used, including nitrogen, the heavier application increased yield 20 per cent (Paddocks 7A and B). On Ladino clover-timothy pasture, treated solely with manure and P_2O_5 , the larger application of fertilizer resulted in a 10 per cent increase in yield (Paddocks 10A and B).

The response of pasture yield to nitrogen treatment was particularly noticeable. The addition of 50 pounds of nitrogen to P_2O_5 and K_2O resulted in an increase of 885 pounds of milk per acre

(Paddocks 6B and 7B). The addition of 100 pounds of nitrogen caused an increase of 1364 pounds of milk per acre (Paddocks 6A and 7A).

Paddock 13, seeded to a mixture of Ladino clover and Smooth Brome grass, supplied excellent midsummer grazing when the top-dressed native pastures were not producing feed. Paddocks 10 and 15, seeded to Ladino clover and timothy are not comparable with Paddock 13. Paddock 10 was reseeded in 1943 and lost a month of grazing; and Paddock 15 is on shallow soil.

The dry season of 1944 was very favorable for the production of Ladino clover seed. The yields per acre were high, but the heads were on such short stems that more than two-thirds of the seed was left on the ground. The yield per acre harvested by machinery was only 30 pounds of clean seed. Hand harvesting trials with blueberry rakes indicated that a farmer could fill his own demands for seed in a reasonably short period of time.

TABLE 70

Effect of Fertilizer Treatments on Highmoor Pasture Yields in Terms of 4 Per Cent Milk, 1941 to 1944

Pasture paddock	Pasture treatment				Yield in pounds of milk per acre, by years				
	Tons manure per acre	Pounds per acre			1941	1942	1943	1944	Average
		Nitrogen	P ₂ O ₅	K ₂ O					
6A *	—	—	100	100	5175	4375	4040	3547	4284
7A *	—	100	100	100	5450	7950	5890	3300	5048
9A *	10	—	60	—	6525	5725	4632	3420	5076
10A ‡	10	—	60	—	3625	6725	2902	4142	4449
6B *	—	—	50	50	4925	3950	4407	1921	3801
7B *	—	50	50	50	5375	4900	4325	2845	4686
9B *	5	—	30	—	6775	5300	4937	4107	5287
10B ‡	5	—	30	—	3700	5800	2920	3757	4044
13 †	10	—	60	—	4975	4425	6720	5292	5353
15 §	10	—	60	—	3275	2850	2780	5445	3588

* Native pastures that were top dressed.

‡ Seeded to Ladino clover and timothy in 1939 and in 1943.

† Seeded to Ladino clover and Smooth Brome in 1939.

§ Seeded to Ladino clover and timothy in 1939.

NORTHEAST REGIONAL PASTURE LABORATORY. Charles H. Moran. A regional research laboratory for research into laws and principles underlying pasture improvement in the Northeast was approved by the Secretary of Agriculture on February 20, 1936.

This laboratory is established at State College, Pennsylvania, and serves as a focal point for coordinating and integrating fundamental pasture research in the region. Following is a summary based on a report by Doctor R. J. Garber of the research work of the Pasture Laboratory for the year 1944.

A total of 19 cooperative projects are active between the Laboratory and the various Experiment Stations in the region. One of the cooperative projects to be carried on at Orono is a study of the management factors affecting the productivity and persistence of Ladino clover-grass associations. The work at the Laboratory may be classified into the three major fields of Cytogenetics and Breeding, Physiology and Composition, and Pathology.

Studies are being made in the field of Cytogenetics and Breeding with selections of orchard grass, white clover, tall fescue, timothy, and Sudan grass. Some of the selections are being inbred for the establishment of selfed lines. Others are being studied for the inheritance of male sterility and rust resistance. The chromosome makeup and behavior of many of the species are also being studied.

A wide variety of studies is being made in the fields of Physiology and Composition. Orchard grass-Ladino clover and brome-grass-Ladino clover associations in the field were studied for the effect of height, effect of time and frequency of cutting, and effect of spring applications of nitrogen. During the first year nitrogen increased the yield of the grass at the expense of the clover. Both with and without nitrogen the yield of clover (excluding the yield from grass) decreased progressively as the first cutting date approached the maturity of the grass. Height of cut had little effect on the total yield in the first harvest year.

With irrigation and heavy nitrogen fertilization, Kentucky bluegrass and white clover produced an average of 40 pounds or more of dry matter per acre per day during June, July, August, and September. Irrigation without nitrogen resulted in a high percentage of clover in the mixture during midsummer and fall. Clover was maintained in high percentages with application of nitrogen up to 40 pounds per acre.

Greenhouse tests on seedling response to phosphate fertilization showed that grasses responded more to high rates than did the legumes. At lower rates of phosphate fertilization the legumes produced greater dry matter yields than the grasses and

this response did not seem to be due to a deficiency of other nutrients.

In the field of Pathology, studies are being made of the effect of fungicides on the germination of treated seeds. Such treatment materially affected Sudan grass but not the other species tried.

A collection of meadow fescue plants highly resistant to crown rust has been made. Selections of these plants with varying degrees of susceptibility are being made for use in identifying races of crown rust attacking meadow fescue.

Experiments with the *Stagonospora* leaf spot of orchard grass showed that the spores remained viable for at least six months in dried plant material.

THE CAROTENE CONTENT OF SOME MAINE GROWN GRASSES AND LEGUMES, AND LOSSES OCCURRING IN DEHYDRATION AND STORAGE. Bernie E. Plummer, Jr., Charles H. Moran, Joseph A. Chucka, and Gordon M. Cairns. Vitamin A is one of the important vitamins in the nutrition of farm animals, because it is necessary in their diet for proper health and growth. It is largely provided to these

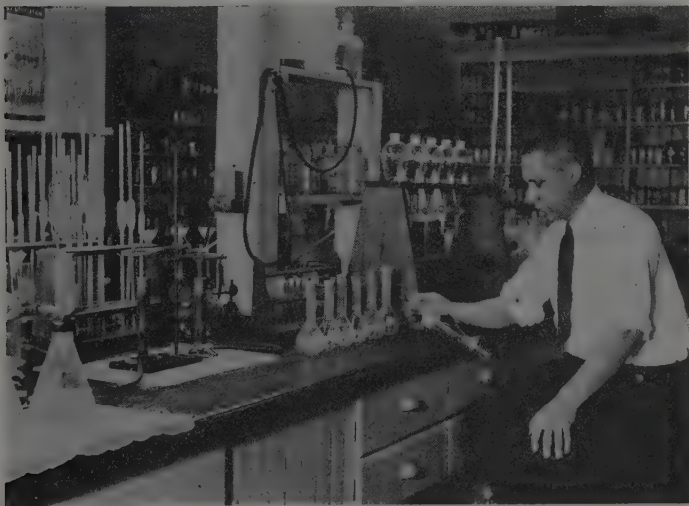


FIG. 2. Chemical Determination of the Carotene Content of Grasses and Clovers, Experiment Station Laboratory at Orono.

animals, especially to dairy cows, by forage crops in the form of carotene. Studies have been continued to determine the carotene content as well as other nutritive values of some grasses and legumes commonly grown in Maine.

The feeding values of dehydrated samples of Ladino, medium red, and alsike clovers, as well as lawn clippings, are given in table 71. All of these samples have good quantities of carotene, the young grasses and clover being very high. Ladino clover also is a valuable source of protein, the average of seven samples being 22.6 per cent.

TABLE 71

*Comparative Feed Value of Dehydrated Samples of Maine-Grown Grasses and Clovers Harvested During 1944**

Kind of grass or clover	Number of samples	Moisture per cent	Carotene p.p.m.†	1000 units Vitamin A per pound†	Protein per cent	Fiber per cent	Fat per cent
Ladino clover	7	6.6	238	180	22.6	16.3	3.9
Medium red clover	4	6.4	216	164	16.7	23.6	3.1
Alsike clover	2	5.3	205	154	18.4	21.2	2.9
Lawn clippings	1	8.9	417	315	22.1	17.8	4.6

* The date of cutting these samples was between June 28 and July 27. The moisture content is for the dehydrated material; all the other results are calculated on a moisture-free basis.

† Carotene content expressed in p.p.m. is parts per million.

† Expressed as equivalent international units of Vitamin A.

Large losses in carotene may occur in the natural curing of hay. Analyses of samples of hay cured under unfavorable weather conditions indicate that nearly all of the carotene was lost. In order to determine what these losses would be when samples were dried artificially, the carotene content was determined on fresh material and after dehydration. The results of this study are given in table 72. Ladino clover was found to be very high in carotene for the fresh material as cut, but a large percentage was lost by dehydration. Medium red and alsike clover contained less carotene in the fresh material, but lost a lower percentage on drying.

The stage of maturity at time of cutting has a marked effect on the feeding value of grasses and clovers. The young immature plants are much higher in carotene and protein, and lower in fiber than are mature plants. Second crop Ladino clover, for example,

TABLE 72

Comparison of the Carotene Content and the Loss in Carotene by Dehydration of Maine-Grown Clovers Harvested During 1944

Kind of grass or clover	Number of samples	Date of cutting	Carotene in p.p.m.*		Per cent loss in carotene
			Fresh material	Dehydrated material	
Ladino clover	8	June 28- July 25	442	242	46
Medium red clover	8	July 10-27	277	219	21
Alsike clover	1	July 27	266	230	14

* Carotene calculated on a moisture-free basis.

when cut on July 12 while young, green, and in blossom contained 270 p.p.m. of carotene, 25.1 per cent protein, and 15.3 per cent fibre. Another sample cut August 22, containing much old dead bloom, and brown and yellow leaves, had only 124 p.p.m. of carotene, 21.2 per cent protein, and 17.8 per cent fibre. The high carotene content of immature grasses also is illustrated by the 417 p.p.m. of carotene in lawn clippings.

Dairy cattle receive large amounts of carotene during the summer months by grazing on good pasture. For winter feeding when pasturage is not available, grass and clover can be preserved in the form of silage. In an effort to determine among other things the value of grass silage as a source of carotene, a silo was filled at Highmoor Farm during the summer of 1944 with a mixture of grass and clover. This mixture was predominantly Ladino clover and timothy. Samples of the fresh material were taken at the time the silo was filled and duplicate samples buried in bags in the center and outer edge of the silo. These samples were representative of the different fields or plots of material put up for silage. The moisture and carotene content were determined on the fresh samples and on the samples of silage as fed out in March and April of 1945. A summary of the results is given in table 73.

The results indicate that there was no material difference in the carotene or moisture content before and after ensiling. The grass-clover mixture was a valuable source of carotene which was not lost by preserving as silage. There was no appreciable loss in carotene content in storing silage for longer periods of time as from mid-March to mid-April in 1945, or from the last of Decem-

TABLE 73

*Effect of Ensiling on the Carotene Content of Maine-Grown
Grasses and Clovers Ensiled in 1944 and Fed During
March 6 to April 18, 1945*

Item	Fresh material when cut into silo	Silage when fed
Number of samples	7	14
Moisture, per cent	68	70
Carotene, p.p.m.:		
Fresh condition	81	81
Moisture-free basis	259	273
1000 Int. units Vitamin A per pound on moisture-free basis	196	207

ber to the middle of May in 1944. Analysis of silage preserved in a silo for two years showed no appreciable loss in carotene.

The carotene can be lost in silage if spoilage takes place. Analysis of a sample near the top of a silo where spoilage had taken place was found to contain only 9 p.p.m. carotene. There was no consistent relationship in the differences between center and outside samples of silage analyzed. Sometimes the center was higher in carotene content and sometimes the outside. The average is slightly better for the center samples. The average in 1943-44 for 9 outside samples was 65 p.p.m. carotene compared with an average of 71 p.p.m. carotene for 9 center samples.

BARN HAYDRIER. Charles H. Moran, Gordon M. Cairns, Bernie E. Plummer, Jr. One of the limiting factors in the production of high quality hay is the difficulty in curing. A system of barn curing has been developed to complete the drying of partially field-cured hay. This method prevents loss from shattering, lowering of quality by bleaching, and damage by weather.

A barn haydrier based on plans developed jointly by the Tennessee Experiment Station and the Tennessee Valley Authority was installed in part of the mow at Highmoor Farm in August 1944. The system consists of specially constructed air ducts laid on the mow floor. A large fan connected to the ducts forces outside air through the hay and removes the moisture.

The process of mow curing supplements the rapid removal of moisture in the field after cutting. The partial drying in the field reduces the moisture content 40 to 50 per cent, and in that way reduces the length of the barn curing process and the cost of

operation. Although the system was installed at Highmoor too late to process much hay in 1944, a mixture of second crop Ladino clover, alfalfa and timothy was cut during the morning of August 8, 1944 and placed on the ducts in late afternoon. This hay was completely cured in seven days.

Samples were taken for analyses when the hay was cut, from the windrow in wilted condition, from the barn after 1½ months storage, and after six months storage. Each of these samples was analyzed for moisture, protein, fat, fiber, and carotene. On a dry matter basis, the green material contained 434 p.p.m. carotene, that in the wilted condition 296 p.p.m., after 1½ months storage 184 p.p.m., and after 6 months storage 158 p.p.m. (Table 74). The protein content remained about the same, around 19 per cent. This barn dried material was bright green in color and very palatable. The carotene content was very high compared with samples of field cured hay after storage which ran about 20 to 30 p.p.m. carotene.

TABLE 74

*Analyses of Hay Artificially Dried in the Barn**

Description of sample	Date of carotene analysis	Moisture per cent	Carotene† p.p.m.	1000 units†† Vitamin A per pound	Protein‡ per cent	Fiber‡ per cent	Fat‡ per cent
From swath when cut	Aug. 9	72.4	434	328,104	18.7	26.8	3.8
From windrow in wilted condition	Aug. 9	50.6	296	223,776	18.1	27.4	3.7
From barn after 1½ months	Sept. 29	9.7	184	139,104	19.2	26.4	4.1
From barn after 6 months	Feb. 23	6.5	158	119,448	20.7	27.0	4.0

* The hay consisted of a mixture of second crop Ladino clover, alfalfa, and timothy which was cut at Highmoor Farm on August 8, 1944, wilted in the field, and then artificially dried in the barn.

† On moisture-free basis.

†† Expressed as equivalent international units of Vitamin A.

WINTERING DAIRY HEIFERS IN A SHED WITH YARD, AS COMPARED TO TYING UP IN BARN STANCHIONS. Gordon M. Cairns, Bernie E. Plummer, Jr. During the winter feeding period of 1943-44 one group of four Jersey heifers was housed and fed in a

shed. They had access to an outside yard. Another similar group was tied in stanchions in the milking barn and had no exercise other than going to and from the scales on weigh days. The amount of grain fed per head daily was the same for both groups. Silage was fed according to the weight of the animals, and hay consumption was not limited. The rate of gain was greater and the feed requirements per pound of gain lower for the stanchion group. However, the gain in height at the withers was approximately the same for both groups.

In the summer of 1944 both groups were pastured together and weights obtained every 28 days. The heifers housed and fed in the shed gained enough faster during the pasture season so that the average total gain for the year was within three pounds for the heifers in the two groups.

Two similar groups were fed through the winter of 1944-45. The rate of gain was greater and the feed requirements lower for the group housed in the stanchions. This was similar to the results obtained the year before.

Data on feed consumption, body weight and analyses of the feeds fed were obtained. See Table 75. The evidence to date indicates that, with an abundant supply of roughage available for winter feeding, heifers can be housed and fed satisfactorily in a shed with access to an outside yard. Such heifers have an opportunity for exercise, which may be an advantage in their development, as

TABLE 75

*Analysis of Feed Fed to Dairy Heifers in 1943-44, and 1944-45**

Type of feed	Moisture per cent	Carotene p.p.m.	Protein per cent	Phosphorus per cent	Calcium per cent
1943-44:					
Grain	11.2	—	16.8	0.65	0.20
Hay	7.4	3	8.0	.19	.41
Grass and clover silage	71.7	215	13.3	.51†	.72
1944-45:					
Grass and clover silage	70.0	273	16.1	.28	.84
Corn silage	76.9	74	9.1	.19	.20

* The grain mixture and composite sample of hay were received for analysis about June 7. The samples of silage were received as the silage was fed, including 10 samples in 1943-44 and 14 samples in 1944-45. The moisture content is for fresh material; all the other results are calculated on a moisture-free basis.

† The percentage of phosphorus in silage during 1943-44 was higher than in 1944-45 because phosphoric acid was added in 1943 as a preservative to one of the two silos. The silage with preservative averaged 0.70 per cent as compared with 0.28 for that with no preservative. No preservative was used in 1944-45.

compared with those tied in barns during the winter without exercise.

CALFHOOD VACCINATION AS A MEANS OF CONTROLLING BANG'S DISEASE IN MAINE DAIRY HERDS. J. Franklin Witter. The records on 250 "B" herds (calves vaccinated and adults negative to the test) and 50 "C" herds (calves vaccinated and adults infected) have been examined and data compiled relative to the efficiency of calfhood vaccination. Over 2000 vaccinated calves were considered in the analysis, with records based on blood tests by the Maine Department of Agriculture.

In the "B" herds, 89 per cent of the vaccinated calves of all ages were negative on the last recorded blood test. About 7 per cent of the vaccinated calves were suspicious and 4 per cent were reactors, making 11 per cent of the vaccinated calves in clean herds which had not as yet cleared satisfactorily. Of the vaccinated animals which cleared following vaccination, 47 per cent were negative within twelve months, 35 per cent required between twelve and twenty-four months, 14 per cent required between twenty-four and thirty-six months and 4 per cent required more than thirty-six months. Herds under State and Federal supervision are usually required to dispose of vaccinated animals which do not clear within eighteen months following vaccination.

In the 50 "C" herds studied where vaccination is practiced under conditions of exposure to infected cows, the results were not so satisfactory. Records of vaccination in these herds were not complete, but data were available for 171 vaccinated calves of which 102 had certificates of vaccination on file. About 79 per cent of these vaccinated calves were negative on the last recorded test, 11 per cent were suspicious and 10 per cent were reactors. Twenty-one per cent failed to clear up satisfactorily. Of those calves with vaccinated certificates, 82 per cent became negative and 18 per cent remained suspicious or positive.

This study is being continued and will prove more significant each year because the State-wide testing program has become more intense and hence better records over a longer period of time will be available.

THE EFFECT OF MANAGEMENT, HEREDITY AND THERAPY ON THE CONTROL OF MASTITIS IN THE DAIRY HERD. J. Franklin Witter, Gordon M. Cairns. The effect of management on mastitis in the University herd is being studied, but not much practical information

is available as yet. The present labor arrangement makes it necessary for cows to be milked by several milkers, often a different one morning and evening. This may prove to have some relationship to the incidence of mastitis. The effect of other management practices such as washing the udder prior to milking and properly preparing the cow for the letting down of milk are being studied. Several of the udder flare-ups have followed self-inflicted teat injuries.

A total of 2,392 quarter samples have been tested this year in the University herd, and 276 quarter samples from cows in the Experiment Station herd at Highmoor. Twenty-two cows were treated, involving 64 quarters. The treatments so far have consisted of udder infusion with sulfanilamide in oil, or tyrothricin. Some of the cases treated were long standing and more or less hopeless. Some were acute flare-ups, and others were quarters showing infection on microscopic examination or culture, but without clinical signs of mastitis. About one-half of the treated quarters cleared up. Sometimes two or more series of treatments were required. This success is tempered by the fact that some cows which were treated when dry came into their new lactation free of trouble only to show infection several weeks later. A number of treated quarters were clear of infection from one week to several weeks following, but subsequently showed infection again. These were not considered successful treatments.

It seems obvious so far that freeing the udder of the mastitis streptococci or any other infection by means of infusion treatments will in no sense guarantee against re-infection. The results so far suggest that quarters treated soon after they begin to show infection are more likely to clear up than quarters which have been infected a long time. This emphasizes the need of continued laboratory testing of milk samples in order to keep abreast of the problem of mastitis. It is of interest to note that a few quarters became clear of mastitis streptococci without treatment, and that some quarters showed an increase in leucocytes in the milk temporarily without any infectious bacteria appearing in the milk.

Penicillin has promise of being a valuable treatment and is to be added to the list of infusion treatments.

BREEDING EFFICIENCY OF BULLS IN MAINE ARTIFICIAL BREEDING ASSOCIATIONS AS RELATED TO QUALITY OF SEMEN. J. Franklin Witter. A total of 160 semen examinations were made, represent-



FIG. 3. Continued Testing of Milk Samples, Better Milking Procedure, and Treatment of Selected Animals Are Essential in the Control of Mastitis.

ing about 70 ejaculates from bulls of three breeds, all connected with the artificial breeding associations. Examinations were made before and after transportation and before and after dilution. Only a limited amount of work could be done on this project because certain items of equipment could not be procured. The distance to the artificial breeding association farms made frequent examinations impractical. While there are insufficient data to warrant many definite conclusions, it can be said that semen can be successfully diluted and shipped from either of the two association bull farms to any part of the State now being served. It was also observed that semen samples from some bulls seemed to become more active after dilution (egg yolk-citrate diluent) and storage, and that individual bull's semen varied in quality from one examination date to another.

A FARM DAIRY CHEESE. Llewellyn M. Dorsey. Details of manufacture of an easy-to-make and quick-to-cure cheese were perfected during the year. The equipment required for making this cheese on a small scale was limited to utensils common to the farm home and items which could be made easily with materials at hand or readily obtainable (except for rennet paste).

Rennet paste was used to set the milk instead of rennet extract. Rennet paste is a preparation of lambs' and kids' stomachs and sometimes calves' stomachs. It is semisolid in nature and just at present is available commercially in large quantities only. The manufacturer is working to produce a dry powder form. This rennet paste not only coagulates milk but supplies an agent which breaks down milk fat releasing volatile flavor principles which aid in producing a flavorsome cheese after 6 to 8 weeks curing at 65° F.

Forms for moulding the cheese were made from $\frac{7}{8}$ " planed boards of any kind of wood, soft or hard. They are 6" x 6" x 8" inside dimensions, open top and bottom. Similar forms, but 6" deep instead of 8", were used for salting forms. Drain boards $8\frac{1}{2}$ " x $8\frac{1}{2}$ " and follower boards $5\frac{7}{8}$ " x $5\frac{7}{8}$ " were used. Cheese-cloth, four to five layers thick, was used to cover the drain boards. Clean burlap two layers thick could be used just as well.

Complete details for the making of this cheese will be contained in a forthcoming bulletin. The finished cheese is 6 inches square and from $2\frac{1}{2}$ to 3 inches thick according to the richness of the milk from which it is made. The weight varies accordingly from $2\frac{1}{4}$ to $2\frac{3}{4}$ pounds. While the cheese is somewhat open in texture it has a firm body. The flavor is developed sufficiently at about eight weeks to be satisfactory. If the cheese is then placed at about 35° F. temperature it holds its flavor without much additional increase for a long period of time.

The cheese can be made from half-skimmed milk and will be very good. However if skimmed milk is used there is very little increase in flavor over a long period because the flavor is limited to casein changes without an increase in flavor from the breakdown of milk fat.

PREVENTION OF MOLD GROWTH ON SURFACE OF CHEESE. Llewellyn M. Dorsey. The purpose of this project was to determine the effect of sodium propionate as a mold preventive on the surface of cheese. After the cheese had been salted by the dry salting method, it was washed and then brushed on all surfaces



FIG. 4. Equipment for Making Farm Dairy Cheese From 3 Gallons of Milk, Showing Cheese Form at Left and Salting Form at Right.

with a 5 per cent solution of sodium propionate in water. This treatment was applied on each of the first two days when the cheese was placed in the curing room. The cheese was free from mold growth from the time it started curing until and after it was paraffined. A few cheeses which were held up to a year in 35° F. temperature did not show mold on their surfaces even though cracks formed in their paraffin coatings because of shrinkage. This type of treatment does not have any detrimental effect upon the flavor of the cheese.

MINNESOTA TEST FOR FAT IN ICE CREAM. Llewellyn M. Dorsey, Millard G. Moore. During the year some trials were conducted in using the Minnesota Test for determining the fat content of ice cream. This test was checked for results in comparison with the official ether extraction method (Röese-Gottlieb) by one investigator and against the Mojonnier method (modified Röese-Gottlieb) by the other. Indications are that the Minnesota test offers a fairly reliable laboratory check test for ice cream samples and would save much time in routine testing for conformance to fat standards. Border line tests and those under standard would be subjected then to the official method for final judgment. Further work will be

done on this project.

D.D.T. FOR THE CONTROL OF FLIES IN DAIRY BARNs. Frank H. Lathrop. During the summer of 1944 and again in 1945 tests were made of D. D. T. insecticides for the control of flies (mostly house-flies, *Musca domestica*). It was found that a remarkable reduction in the number of flies was obtained by thoroughly spraying the inner walls and ceilings of the University of Maine dairy barns at Orono and the Experiment Station dairy barn at Highmoor Farm. A wettable insecticide powder containing 20 per cent D. D. T. was used at the rate of 10 pounds of the dry powder in 100 gallons of water. A power-driven sprayer was used.

Four applications made at Orono at intervals of about three weeks, beginning the first week in July, kept the fly infestation at a very low level. Two applications to the heavily infested manure pit appeared to be very effective.

At Highmoor Farm one application in July and one in August kept the fly population at a reasonably low level for the rest of the season.

In spraying the barns, precautions were taken to avoid getting the spray on the feed or into the drinking water. No undesirable effects upon the cattle were noticed.

PUBLICATIONS

Further information may be had by those interested by writing to the individuals in charge of the various studies. Publications of the Station are mailed free upon request.

The following list of the more recent publications may be of interest and are available for distribution:

BULLETINS

- 429. Use of Machinery and Horses on Maine Farms Keeping Dairy Cows.
- 436. Use of Labor on Maine Farms With Dairy Cows.
- 437. Trend in Size of Loads and Delivery, Costs for Labor in Milk Distribution in Boston and Portland.

FRUITS

The progress on research with fruits is summarized briefly in this report. Apples and blueberries continue to receive the major emphasis. Several of the studies with blueberries have been completed and the results are published in bulletins of the Station. Those interested particularly in blueberries may have any of these bulletins upon request. They are listed by title on the last page of this report.

APPLES

TRENDS TAKING PLACE IN THE APPLE INDUSTRY IN MAINE. Charles H. Merchant. Several surveys taken over a period of years indicate that the apple industry is undergoing many changes. These changes include varieties of apples grown, storage facilities for apples, and the marketing of the apple crop. Economic conditions and severe winter injury to trees of certain varieties have been responsible for these changes. These and other changes which have taken place during the past 20 years may be especially significant to the apple industry in the postwar period.

The trend in apple varieties has been from many varieties consisting chiefly of winter apples to relatively few varieties mostly of fall apples. In 1926¹ the Baldwin variety ranked first, Ben Davis second, McIntosh third, and the Stark fourth in order of importance. In the 1940 survey,² the McIntosh not only ranked first but over one half of all trees were of this variety. The Baldwin variety ranked second and had about one eighth of the bearing trees and a very small percentage of the nonbearing trees. Slightly over 60 per cent of the apple crop on 305 farms³ in 1942 and 1943

¹ Merchant, Charles H., *An Economic Survey of the Apple Industry in Maine*, Maine Agricultural Experiment Station Bulletin 339, April 1927, p. 163.

² Merchant, Charles H. and Johnson, Joseph M., *A Survey of the Apple Industry in Maine*, Maine Agricultural Experiment Station Miscellaneous Publication 565, February 1941, p. 10.

³ Manuscript on the postwar apple industry in Maine by Charles H. Merchant. This manuscript contains detailed information and the material may be released at an early date as a Maine Agricultural Experiment Station publication.

were of the McIntosh variety. With a high percentage of non-bearing trees of this variety and of other fall varieties, as Cortland and Delicious, larger crops of fall varieties of apples may be expected in the postwar period. In contrast, relatively smaller crops of winter apples may be expected.

The transition in the varieties of apples produced in the State has been responsible in part for the increased importance of apple storage facilities. Adequate storage facilities are necessary to maintain the quality of McIntosh and other fall varieties, especially when the apples are to be sold throughout the late fall and winter months. In meeting the needs for improved storage facilities, some apple growers have remodelled their farm buildings and others have constructed new buildings. Apple growers in 1926⁴ sold over 63 per cent of their apple crop before November and 86 per cent before December 1. In 1939 nearly 60 per cent of the apple crop on 266 farms was stored. Of the apples stored less than one half were placed in cold storage. Surveys in 1943 and 1944⁵ did not include the quantity of apples stored but showed that over 60 per cent of the stored apples were placed in cold storage. The information obtained shows that there have been upward trends in the quantity of apples stored and in the per cent of stored apples placed in cold storage. Several farmers have cold storage facilities on their farms and others are thinking of adding cold storage equipment in their present storages.

During the past 20 years, when changes have occurred in the varieties of apples grown and in the amount of apple storage facilities, equally important changes have taken place in the methods of selling apples. Formerly, many orchardists sold their apples to buyers who visited the orchards in the fall and large quantities of Maine apples were exported. At present these market outlets are much less important and more orchardists have developed their own market outlets. Adequate storage facilities permit growers to move their crop to market throughout the fall and winter months in accordance with market conditions. In the postwar period an increased interest in the selling of the apple crop on the part of growers may be expected.

APPLE BREEDING. Russell M. Bailey, J. Howard Waring, Eugene C. Ogden. The program to develop or locate better late sea-

⁴ Same as footnote 1.

⁵ Same as footnote 3.

son apple varieties for Maine was continued during the past year. About 1,500 trees originating from controlled crosses have been under study at Highmoor Farm. Several of those which have fruited appear worthy of further trial.

New apple varieties developed elsewhere are under trial also. Several appear worthy of comment. Milton ripens about three weeks ahead of McIntosh, and produces attractive, uniform fruit of dessert quality. The tree is of excellent vigor and type and has borne a crop annually. This variety deserves more extensive trial. Macoun deserves further trial in Maine because of its very high dessert quality and attractive appearance. The season is about the same as McIntosh. The trees appear to be of annual bearing habit but tend to produce rather light crops. Kendall has borne good annual crops of very attractive, McIntosh-type fruits that keep longer. The quality appears inferior to McIntosh. Prairie Spy (Minnesota No. 1001) has possible value in Maine as a late keeping culinary variety in view of the very attractive fruit and desirable tree type and habits. The fruit appears to be of mediocre quality. Minnesota 1301 is an attractive late keeper of culinary quality worthy of continued study but unfortunately is of biennial bearing habit. Medina resembles Red Delicious in type but produces larger fruits. It does not color as attractively as Richared but appears about equal to Red Delicious at Highmoor in this respect. It deserves further trial in view of its late keeping and good dessert quality.

ORCHARD COVER. Russell M. Bailey. In the spring of 1943 seven cover crops considered to merit trial in permanent sod orchard management were obtained from the United States Department of Agriculture Soil Conservation Service and planted in 1/10 acre plots at Highmoor. These comprised planting of crown vetch (*Coronilla varia*), field brome (*Bromus arvensis*), orchard grass (*Dactylis glomerata*), Quebec creeping red fescue (*Festuca rubra*), black medick (*Medicago lupulina*), switch grass (*Panicum virgatum*), and ladino clover (*Trifolium repens latum*). Notes taken in the spring of 1945 on uniformity of stand, density and habit and quantity of growth suggest that the following should be further tested in Maine orchards.

Orchard grass (*Dactylis glomerata* var. *Tammisto* 2574) survived well, establishing a uniform, nearly pure stand of plants, and

produced abundant growth of cover material. It does tend to develop a bunchy sod. The rather coarse stiff stems are likely to cause fruit puncture to dropping fruit if the grass is mowed late in the season.

Quebec creeping red fescue (*Festuca rubra* 2579) has established an excellent uniform, dense, tough sod that should aid in supporting vehicles used in the orchard. The creeping fine stems produce a mat that makes an excellent cushion for dropping fruit.

Ladino clover (*Trifolium repens latum*) established a good stand that has persisted well but has tolerated competition of other species, particularly some of the grasses. Ladino clover is known to be well adapted to most Maine soils and should be of value when sown in mixtures with grasses in the early years of establishing an orchard sod.

ORCHARD SOIL MANAGEMENT. Joseph A. Chucka, Russell M. Bailey, J. Howard Waring, Eugene C. Ogden. An experiment to determine the orchard response to differential fertilizer treatments in a sod-mulch orchard is in progress at Highmoor Farm. This comprises annual applications of nitrogen (N), nitrogen-potassium (NK), and nitrogen-phosphorus-potassium (NPK) in inorganic form. Manure as an organic fertilizer is compared to inorganic forms. The value of additional hay mulch in combination with the various inorganic fertilizer treatments is also included in the study. Rates of application are 60 pounds per acre each per year for N, P_2O_5 , and K_2O and 200 pounds of hay per tree for the mulch plots. Although several years will be required before definite conclusions can be drawn, analysis of the 1943 and 1944 tree yields shows the following trends: (1) a marked increase in comparative yield of trees receiving hay mulch regardless whether inorganic treatment consisted of N, NK, or NPK, (2) yields of trees receiving manure alone were slightly less than those treated with an equivalent amount of nitrogen in inorganic form, (3) trees fertilized with inorganic nitrogen and potassium yielded somewhat more than those receiving nitrogen alone, (4) addition of phosphorus thus far has not increased yield in this experiment. Several years' data will be required to establish the validity of these trends.

APPLE SPRAYING EXPERIMENT. Donald Folsom. McIntosh trees, 334 in all, originally set out in the spring of 1928 were used as

count trees. Six rows were continued with mild sulphur⁶ of which the kind used this year was Mike. Six rows were shifted from dry lime sulphur to Fermate.⁷ The 13th row, shorter than the others, in part received Puratized N5X⁸ and in part (check plot) received only a few squirts of lead arsenate where nests of tent caterpillars were seen. Mike, Fermate, and Puratized were used at the rates of 10 pounds, 2 pounds, and 1/10 gallon respectively per 100 gallons water.

The pre-pink, pink, and calyx applications were made at dates that were about average or normal for the past 15 years. Four other applications also were made. The last one, July 25, was not made late enough, apparently, to prevent the development of some storage scab. Except on the check trees, about 21 gallons per tree were applied during the season, or three per tree per application.

Scab Control. Leaf scab June 26 was 9.6 per cent on the check trees, less with Mike and Fermate and least with Puratized. It was 39.2 per cent on August 5-15 on check trees, 12.4 per cent on Mike and 15.7 per cent on Fermate trees, and 2.5 per cent on Puratized trees, with all differences significant except between Mike and Fermate. About half of the scab on the Puratized trees was burned out.

About 5,400 fruits were examined. The percentage of scab for all apples together under each treatment was 89.3 for checks, 2.0 for Mike, 2.2 for Fermate, and 1.1 for Puratized. Averages for 8 to 10 trees per treatment, one bushel or so per tree, were 89.1 per cent for checks, 2.0 for Mike, 2.1 for Fermate, and 0.7 for Puratized, with no differences significant except between checks and treated. Under each treatment, 8 to 10 trees were used for both leaf-scab and fruit-scab counts on the same tree; on these there was no significant correlation in any series between leaf-scab percentage and fruit-scab percentage.

⁶ Kinds of "mild sulphur" used in this orchard have been Koloform, flotation (paste and dry wettable), micronized, and Mike, representing respectively roller-milled, chemically precipitated, Micronized, and Grinrod-processed products. See following references: Gr-t Groves, A.B. The elemental sulfur fungicides. Va. Agr. Exp. Sta. Tech. Bul. 82. 1942. Gr-s Groves, A.B. Sulfur sprays. Va. Agr. Exp. Sta. Bul. 359. 1944.

⁷ DuPont trade name for their product containing ferric dimethyldithiocarbamate.

⁸ Trade name for a preparation containing phenyl mercuri triethanol ammonium lactate.

Trunk Growth and Fruit Yield. The yield per tree was generally down from the 1943 yield rate, and, as usual, the growth rate in girth was correspondingly up. The drop in yield was greater for the trees receiving dry lime sulphur in 1943 and Fermate in 1944 than for the trees receiving mild sulphur both years, and the growth in girth was significantly greater for the Fermate trees than for the Mike trees (3.90 *vs.* 3.33 cm.). Therefore, although over a term of years lime sulphur has decreased the yield rate without influencing the girth, nevertheless season *vs.* season, and treatment *vs.* treatment, there was, as usual, some tendency for greater fruit yield to slow up trunk growth.

In blossom abundance, the trees that had received mild sulphur 1941-43 inclusive were superior in 1944 to those that had received lime sulphur 1941-43. (2.86 *vs.* 2.42, with difference significant.) There was also a significant difference in yield rate (268 *vs.* 213 pounds per tree), which may as well be attributed to the lime sulphur treatment and high yield of 1943 as to the Fermate used in 1944.

Other Results. There was practically no fruit russetting, and the unsprayed checks had the most. Fruit size was practically the same in the Fermate and Mike lots (172 *vs.* 169 per bushel). Amount of fruit surface red was also about the same (57 *vs.* 62 per cent).

Conclusions. Fermate had no apparent advantage over Mike in controlling scab. Puratized was more effective than either, and should be tested again, next time on a scale to determine the effect upon growth and yield rate.

HARDY STOCKS. Merle T. Hilborn, J. Howard Waring. Each year the number of kinds of apple and crab apple selections that are being grown in the various experimental plantings is increased as newer material becomes available for evaluation. Since the time interval required to test a potential trunk-forming stock is quite long it is desirable to eliminate any unsuitable material as rapidly as possible. Of the forty-four kinds of hardy stocks under test six can be discarded now for the following reasons. Anis (P.I. 113472)⁹ is definitely lacking in vigor and forms rather poor crotch angles. *Malus Wisantowoye* (P.I. 104998) is somewhat more

⁹ Numbers in parentheses refer to the Plant Introduction numbers for material received from the U. S. Dept. of Agric., Division of Plant Exploration and Introduction, through the courtesy of Mr. F. C. Bradford.

vigorous than Anis, but is still comparatively low in vigor and the general form of the tree has little to commend it. Paragon and Pewaukee were considered doubtful in hardiness last year¹⁰ and on the basis of this year's data can be discarded. Surpasse Frequin (P.I. 125566) has winterkilled almost completely when tested in several locations, even in one planting in southwestern Maine under rather mild climatic conditions. The injury to this variety was typical blackheart in the woody tissues which was occasionally accompanied by some sunscald of the bark. Another variety that had previously shown some promise, 4-7-16, a selection from the Iowa Agricultural Experiment Station, has been completely winterkilled in all the test plantings. The injury was mostly sunscald on the bark, particularly on the southwest side.

The test plantings along the St. John River in Aroostook County have demonstrated that Robusta No. 5 is one of the hardiest of all the stocks under observation, surpassing even Virginia and Hibernial. Robusta No. 5 is a selection of *Malus robusta* obtained from the Canadian Department of Agriculture. The selection is not particularly desirable as stock material for commercial orchards because of the growth characteristics of the tree. There is a tendency for a rather heavy growth of small spurs and the branching habit is far less desirable than that of most other stocks. The present indications of superior hardiness may not continue as the variety is tested over longer periods of time and even if definitely superior in hardiness to Virginia and Hibernial it may well be that the extra hardiness is not necessary in commercial orchards. However, as a trunk-forming stock for home orchards in Aroostook County, Robusta No. 5 may prove to be one of the best stocks to use.

Of the newer importations Bellfleur Kitaika (P.I. 90524), Coulon Renette (P.I. 89799), Kulon Kitaika (P.I. 107229), Noir de Vitry (P.I. 125565), Tayezhnoie (P.I. 107253), and Yakhontowoye (P.I. 104999) continue to show promise and will be propagated for further trials in commercial orchard areas.

CONTROL OF APPLE LEAF SCORCH. Joseph A. Chucka, J. Howard Waring, Oscar L. Wyman. "Leaf Scorch" or magnesium deficiency was again observed in many Maine apple orchards in the fall of 1944. The amount observed varied from only a few

¹⁰ Maine Agr. Exp. Sta. Bul. 426, Ann. Rpt. 1943-44, pp. 315-318. 1944.

trees in an orchard showing the symptoms on a few leaves to most of the trees in an orchard showing some deficiency and several trees being almost completely defoliated.

Experiments on the control of leaf scorch included the use of varying amounts of Epsom salts and magnesium limestone applied to the soil and several spray treatments involving the use of Epsom salts in water and in connection with regular spray treatments.

Epsom salts applied in the fall of 1943 in four orchards at 10, 25, and 50 pounds per tree and magnesium limestone applied at the rate of 100 pounds per tree were only partially effective in the control of leaf scorch during the 1944 season. Careful observation of the trees which had received the treatment indicated that certain branches of the trees showed a marked improvement while others did not. This experiment substantiates previous data secured in Maine and elsewhere indicating that it may take several years for magnesium carriers applied to the soil to correct magnesium deficiency in apple trees.

In one orchard one, two, and three sprays of 20 pounds of Epsom salts per 100 gallons of water were compared on McIntosh trees. Each spray treatment was used on a row of 27 trees and one row was left untreated. The 27 trees which were not sprayed with magnesium showed a 28 per cent increase in leaf scorch as compared to the 1943 leaf scorch readings. The three rows that were sprayed with magnesium showed reductions in leaf scorch of 11, 70, and 81 per cent, respectively, for the trees which received one, two, and three spray applications. In addition to showing less leaf scorch the sprayed trees made greater terminal growth and improved in general vigor as compared to those which were not sprayed with magnesium.

As soon as it was evident that leaf scorch could be controlled by the use of magnesium sprays the question arose as to whether magnesium had to be applied in separate sprays or whether it could be safely added directly to the usual sprays used for the control of insects and diseases. If it could be added to the usual sprays without reducing their efficiency in the control of insects and diseases it would avoid the necessity of making several special applications. In an attempt to answer this question a small test was conducted at Highmoor Farm in which both lime sulfur and mild sulfur sprays with and without added magnesium were compared.

Magnesium was added at the rate of 20 pounds of Epsom salts

per 100 gallons of spray mixture in each of four cover sprays and both leaves and fruit were examined for apple scab. These examinations indicated that the addition of Epsom salts to lime sulfur sprays had no measurable effect on the control of scab on either leaves or fruit. The addition of Epsom salts to mild sulfur sprays resulted in no difference in scab on the leaves but slightly increased scab on fruits. In general this experiment indicated that Epsom salts may be added to the regular sprays without seriously affecting their efficiency in the control of apple scab.

Available data and growers' experience indicate that the best known immediate control for leaf scorch is the use of magnesium sprays. These sprays may be made most conveniently by the addition of 20 pounds of Epsom salts to each 100 gallons of regular spray mixture. They should be most effective in the control of leaf scorch if applied at the time of the calyx, first, and second cover sprays.

To prevent the development of leaf scorch in orchards which are not now showing the trouble and to secure a more permanent control in the orchards now showing leaf scorch the use of magnesium limestone is being recommended. It is believed that the magnesium in magnesium limestone will become available to apple trees three or more years after application. The amount recommended is one to two tons per acre.

APPLE INSECTS. Frank H. Lathrop. The summer of 1944 was marked by severe infestations of European red mite (*Paratetranychus pilosus*) in a number of Maine orchards. The summer application of D. N. dust or spray, generally proved effective in reducing the red mite infestation. The apple mealybug (*Phenacoccus aceris*) continued to subside, and, although light to moderate infestation persisted in some orchards, the loss from this pest was generally negligible. The oystershell scale (*Lepidosaphes ulmi*) (Fig. 1) has increased alarmingly in several orchards. The appearance of the scales on the apples is a signal to the fruit grower to apply sprays for combating the pest. When neglected, the scales multiply rapidly and may soon kill twigs, branches, and even larger limbs of the infested trees. The increasing severity of oystershell scale appears to be associated with the generally increased number of applications of sulfur fungicides (sulfur dust or wettable sulfur) made for the control of apple scab. The application of dinitro sprays in the early spring gave satisfactory cleanup of the



FIG. 1. Apple twig severely infested with oystershell scale. Notice the scales on the twig and fruit, and the stunted growth of the twig.

scales, where the application was sufficiently thorough. Results were disappointing where the application was not made with extreme thoroughness. Infestation by the apple fruit fly (*Rhagoletis pomonella*) continued to increase, especially in neglected orchards, and in some localities the fly population was so great that control by means of insecticides was difficult and sometimes unsatisfactory. This was especially true in small orchards in localities where neglected trees are numerous.

Apple Fruit Fly (*Rhagoletis pomonella*.) Frank H. Lathrop, Charles O. Dirks. Because of the importance of the date of appearance of the flies for timing the insecticide applications, a study of the emergence of the flies with reference to the date of McIntosh petal-fall, and in relation to rainfall and temperature was continued

during the summer of 1944. It was found that, compared with actual emergence observed in the experimental cages, the estimate of 0.1 per cent emergence (time for the first fruit fly spray) was between 1 and 2 days late, and the estimate of 50 per cent emergence (time for the second fruit fly spray) was between 3 and 4 days late, although such an error in timing the sprays probably would not have had any disastrous practical effects. The study is being continued with the expectation that the errors can be reduced in the future when more extensive data are available.

Because of the great interest in D.D.T., the new insecticide, a test was made of it for the control of apple fruit fly during the summer of 1944. The experiment was made in an old neglected

TABLE 76

Results of Examinations of Harvested Apples from a Plot Dusted 3 Times with 3 Per Cent D.D.T. Dust, in Comparison with Apples from Untreated Trees

GROSS EXAMINATION OF FRUIT

	Number apples examined	Number apples not stung	Percentage	
			Not stung	Stung
Plot dusted with D.D.T.	950	64	6.7	93.3
Check plot	500	4	0.8	99.20

DETAILED EXAMINATION OF FRUIT

(Examined in addition to the apples included in the gross examination)

	Number apples examined	Number apples not stung	Percentage	
			Not stung	Stung
Plot dusted with D.D.T.	230	7	3.0	97.0
Check plot	100	0	0.0	100.0

DETAILED COUNTS OF EGG PUNCTURES

	Number apples examined	Total number of stings	Average number stings per apple	Percentage reduction on dusted plot
Plot dusted with D.D.T.	230	1996	8.68	66.5
Check plot	100	2592	25.92	—

orchard consisting of 69 trees, including 29 Wolf River. The rest of the trees were McIntosh, Ben Davis, and a few other varieties intermingled. The dust plot included 43 trees. Examinations were made only of the Wolf River apples. The orchard adjoined a block of dense woods on the west; open grassland on the south and east; a small back-yard planting of neglected and heavily infested trees on the north. The entire neighborhood was severely infested with fruit flies.

Three applications of dust were made; first on July 6, second on July 19, and third on July 26. The rates of application were respectively .66, .62, and .49 pound per tree. Conditions were favorable for dusting at the time of each application.

The dust (Gesamol A 3) contained 3 per cent of D.D.T. mixed with an inert carrier.

Examinations of the apples at harvest time showed that, because of the very great fly population in the orchard and the surrounding locality, the D.D.T. dust did not effectively protect the apples from being stung. The number of stings, however, was reduced 66.5 per cent on the dusted apples. Detailed results are shown in Table 76.

SMALL FRUITS

BLUEBERRY INSECTS. Frank H. Lathrop, John H. Hawkins. For the first time since the outbreak of 1924 and 1925, a very destructive outbreak of black army cutworms (*Actebia fennica*) occurred in the spring of 1944, and again in 1945. The combination of a number of adverse factors greatly reduced the yield of blueberries in the summer of 1944. First the black army cutworms destroyed the crop in many places, this was followed by heavy frost that injured the blossoms, and the summer was characterized by severe drought that prevented the proper development of the remaining crop. The crop failure in Washington County was so nearly complete that experiments which had been planned for studying the control of the blueberry fruit fly (*Rhagoletis pomonella*) had to be abandoned for the season. During the early spring of 1945 injury by the blueberry thrips (*Frankliniella vaccinii*) (Fig. 2) was more severe on blueberry land in Washington County than at any time during the past 10 years.

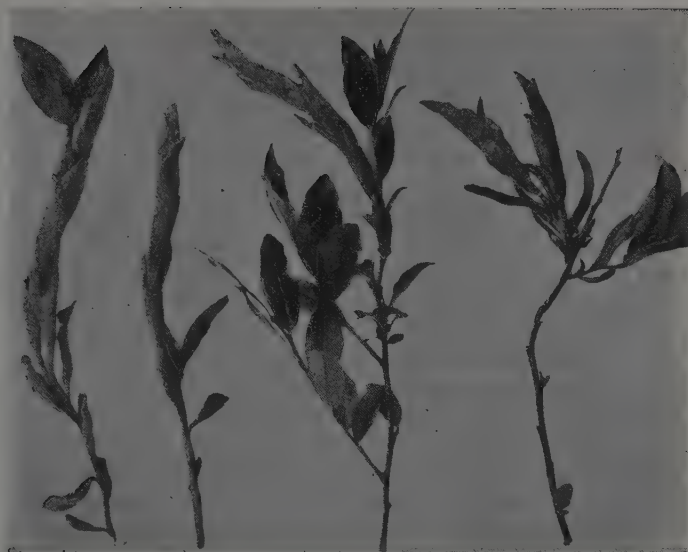


FIG. 2. Typical clusters of blueberry leaves infested by thrips. The thrips are minute insects, almost microscopically small, that during the growing period, live, feed, and multiply within the protection of the tightly rolled leaves.

The Black Army Cutworm (*Actebia fennica*) as a Blueberry Pest. John H. Hawkins. The black army cutworm was found to be causing injury to blueberries during the first week in April of 1945. At that time many of the cutworms were not more than one eighth of an inch in length and the tiny holes through which they entered the buds to feed could hardly be seen without the aid of magnification. Consequently they were infesting blueberries on land where the owners had not noticed them. In some areas a portion of the blueberry crop had been destroyed by April 10.

Insecticides were applied to blueberries in experimental plots in three separate areas where the black army cutworm was causing injury to blueberries. Insecticides used were poison baits, calcium arsenate dust, cryolite dust, copper-lime calcium arsenate dust, and dust containing 3 per cent D.D.T.

By April 17, no further injury to blueberries could be found

on the blueberry plots treated with the 3 per cent D.D.T. dust and these treated plots were not noticeably reinfested by cutworms coming into these plots from other areas.

The plots treated with a bran, molasses, Paris green bait gave a measure of control considerably below that of D.D.T. Cutworm injury in the poison bait plots did not entirely cease by April 17 as was the case in those plots treated with the D.D.T. The cost of the materials in case of the poison bran was in excess of the cost of the 3 per cent D.D.T. material. It is expected that D.D.T. will be on the market during the coming season in quantities sufficient to take care of any needs of blueberry growers.

Blueberry Thrips (*Frankliniella vaccinii*). Frank H. Lathrop. Experiments in the control of the blueberry thrips have been continued through the season of 1944-45. On October 19, 1944 two plots of blueberries heavily infested by thrips were dusted with 3 per cent D.D.T. mixed with an inert carrier. On April 11, 1945 two other plots were dusted with the same material. Each plot was 15 feet square, and approximately 2.5 pounds of dust were applied to each plot. A hand duster was used, and the ground was whitened with the dust. The fall application was made after the thrips had apparently entered winter quarters in the soil. The spring application was made shortly before the blueberry buds were sufficiently developed for the thrips attack.

Examination of the plots on July 3 showed that there was no appreciable difference in the control of thrips on the plots dusted in the fall, compared with the plots dusted in the spring. Control was not complete on any of the plots, and the treatment does not appear to be very promising.

STRAWBERRIES. Russell M. Bailey. Howard 17 is considered the most dependable strawberry variety for general recommendation in southern and central Maine. Unfortunately this variety is highly susceptible to red stele disease which has recently been reported in Maine. Several new selections of considerable promise obtained by crossing Howard 17 with Aberdeen (highly resistant to red stele) and other varieties are under observation at Highmoor Farm. Some of these appear to merit more extensive trials considering their fruit type, hardiness, vigor and disease resistance.

PUBLICATIONS

The following recent publications may be of interest to fruit growers. Any of the Station publications will be sent free upon request to residents of the State.

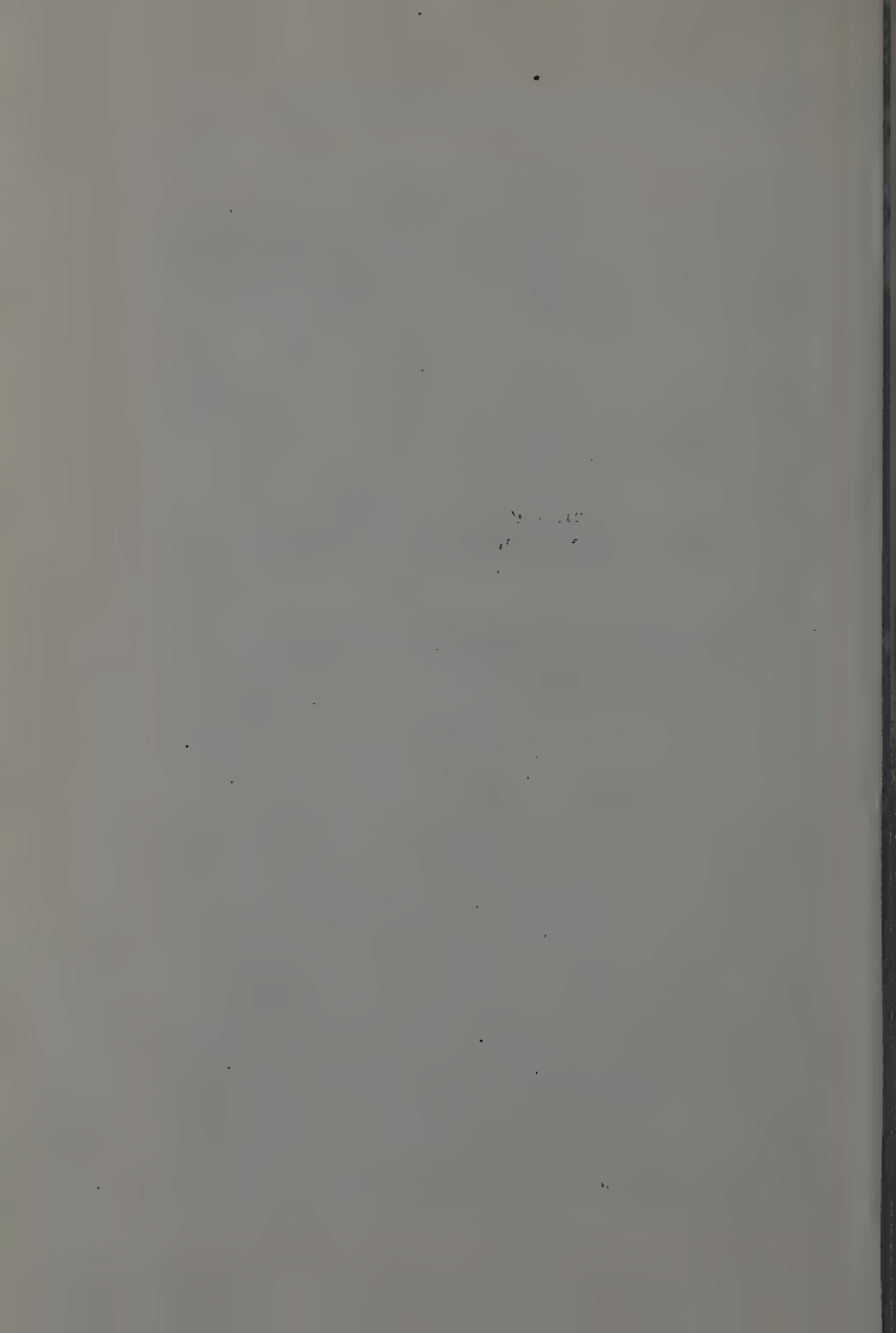
BULLETINS

- No. 419. Blueberry Diseases in Maine.
No. 423. Low-Bush Blueberries.
No. 428. Composition and Uses of Blueberries.

ABSTRACT OF ARTICLE PUBLISHED IN PERIODICAL
TIMING THE SEASONAL CYCLES OF INSECTS: THE EMERGENCE OF
*Rhagoletis pomonella*¹¹

A continuation of a previous paper (Jour. Econ. Ent./37 (2): 199-204, 6 fig. 1944), this study is based upon records of the emergence of 132,129 flies during a period of 11 years. The emergence followed a characteristic seasonal pattern, which takes the form of a sigmoid curve. The curve bears an interesting resemblance to the toxicity curve, resulting from individual variations in the response of the insects to environmental factors, as well as variations in exposure of the individuals to such factors as temperature and moisture. Highly significant correlation was found between emergence and the accumulated daily mean temperatures. Correlation between emergence and accumulated rainfall decreased as the emergence advanced from 0.10 per cent to 90 per cent. An inverse correlation between emergence and the date of petal-fall increased as emergence advanced. By utilizing the correlations with temperature, rainfall, and date of petal-fall, the emergence of given percentage levels was estimated within narrow time limits. Dependable estimation of the emergence of the flies is important for timing insecticide applications for the control of this destructive apple pest. The present paper is a step toward more accurate and more dependable timing.

¹¹ This is an abstract of a paper by Frank H. Lathrop and Charles O. Dirks, having the same title, and published in Jour. Econ. Ent., Vol. 38, pp. 330-334, 3 fig. 1945.



CANNING, FIELD, AND GARDEN CROPS

Recent findings as a result of research with canning, field, and garden crops are briefly discussed in the following pages. Other sections of the Annual Report of Progress, such as "Potatoes" and "Fruits," contain much subject matter which is closely related to the above crops. These sections are available upon request.

BEANS

EFFECT OF BALDHEAD INJURY IN BEAN SEEDLINGS ON YIELD OF DRY BEANS. George P. Steinbauer. "Baldhead injury" is one of several factors that may lead to irregular emergence of beans in the field and the occurrence of defective seedlings. It is characterized by defective terminal growth of the stem and is thought to result, as a general rule, from injuries received during harvesting, threshing, and handling of the seeds. Germination tests on 105 samples of bean seeds offered for sale in Maine seed stores indicate that injury of this type varies from as little as 1 per cent to as high as 25 per cent with most samples having 5 to 10 per cent of the seeds so injured.

Yield studies in 1944 on plants grown from normal and defective (baldhead) bean seedlings confirmed the data obtained in 1943, showing that plants from the defective seedlings give significantly inferior yields of either snap or dry beans than those from normal seedlings. Yields of dry beans were obtained from normal and abnormal plants of the Full Measure variety, using spacings of 3, 4, and 6 inches. At the closest spacing the normal plants outyielded the abnormals in the ratio of nearly 3:1. At the widest spacing the normals outyielded the abnormals at a ratio of 1.5:1. At close spacing, which gave the greatest yield per foot of row, the abnormal seedlings were crowded by the normal plants. This results from the observation, that baldhead seedlings are slow to develop and are severely handicapped when in competition with nearby plants. At wide spacing the baldhead seedlings produce a fair yield.

The data so far obtained indicate that baldhead seedlings occurring in germination tests ought not to be included in the percentage of germination. Under Maine conditions the baldhead seedlings cannot be considered the equivalent of normal seedlings.

BREEDING DISEASE RESISTANT BEANS. Russell M. Bailey, Donald Folsom. Frequently anthracnose seriously damages the bean crop in Maine. Investigations are in progress to develop suitable resistant varieties for the Northeast. Yellow Eye type selections developed by Iva M. Burgess from Yellow Eye, Johnson and pea bean crosses have been under observation for several years in plots for comparison with Yellow Eye and other susceptible varieties. An anthracnose epidemic has generally been obtained by planting hills of diseased beans, scattering of infected refuse and brushing the plants when wet. Many of the selections have remained comparatively free from anthracnose through several years' trials indicating high resistance to anthracnose strains prevalent at Highmoor. Those of best type were planted in 1944 in replicated plots to study their performance in comparison to Yellow Eye with respect to yield and disease resistance.

Halo blight is another bean disease of economic importance to Maine growers. Low's Champion and French's Horticultural, the two varieties most commonly used by Maine canners for shell beans, are both highly susceptible to halo blight. The Red Kidney crop is also frequently severely attacked. Several years ago runner type plants that were apparently resistant were found in a badly infected field of Red Kidneys. These were crossed with several varieties of more desirable type and the progenies together with many standard varieties are under study at Highmoor Farm in a series of plots artificially inoculated with the halo blight organism.

FIELD BEAN VARIETY TRIALS. Russell M. Bailey, Eugene C. Ogden. A frequent problem encountered by growers of dry beans in Maine is severe discoloration or weathering before threshing. This damage is particularly severe with the better known pea bean varieties most of which mature too late to escape fall rains and this results in considerable loss due to the necessity of removing a large per cent of pick-outs. The use of earlier maturing varieties should be helpful in reducing this damage. Lapin, a new variety thought to be of Russian origin and introduced several years ago by the New Hampshire Station, was outstanding in yield and early maturity in the 1944 Highmoor trials. The beans are white and intermediate in size between Yellow Eye and the commonly grown pea beans. Baking tests indicate that Lapin is of good quality.

Nineteen varieties of field beans were in comparative trials

at Highmoor last season. Each variety was planted in four 15-foot, single row plots in four randomized blocks. The performance of those of most interest is shown in Table 77.

TABLE 77

*1944 Performance of Field Bean Varieties at Highmoor Farm,
Monmouth, Maine*

Variety	Bu./A. marketable	Per cent pick-outs	No. beans per oz.	Date ready to pull
White Pea Varieties				
Robust	33.7	6	113	Oct. 1
Jones Pea	29.8	8	105	Sept. 27
Honeoye	29.3	15	118	Oct. 2
Emerson	28.4	7	113	Oct. 2
Genesee	27.6	8	105	Oct. 3
ASL Large Pea	27.6	4	113	Sept. 6
Michelite	26.7	11	118	Oct. 2
Dunning Small Pea	26.5	7	123	Sept. 12
Yellow Eye Strains				
Highmoor Bush	30.1	1	62	Sept. 3
B. & M Bush	28.5	1	71	Sept. 3
Highmoor Runner	28.6	7	63	Sept. 17
Red Kidney Strains				
Libby (light red)	31.4	5	44	Oct. 1
Mahogany (dark red)	24.4	8	58	Oct. 5
Haskell (light red)	24.3	6	59	Oct. 3
Miscellaneous				
Lapin (white)	35.0	2	83	Sept. 2
Olaf (blue and white)	34.1	1	60	Sept. 1
Perry Marrow	33.1	2	60	Sept. 12
Jacob's Cattle	33.1	1	64	Sept. 1

SHELL BEAN TRIALS. Russell M. Bailey. Low's Champion is commonly grown for the commercial canning of shell beans in Maine. This variety appears to be very susceptible to halo blight and possibly to common blight, and considerable loss is encountered by growers from these diseases. The use of a more resistant variety of similar type would materially aid in reducing this serious loss.

Six seed stocks of Low's Champion and five other varieties considered to be of promise for the canning industry were compared at Highmoor Farm, Monmouth, in 1944. Halo blight rapidly spread in the trial plots and by harvest time all the Low's Champion plots exhibited severe disease symptoms. The other varieties listed in order of yield were Red Cranberry, Chinese Jumper, Flash,

Brilliant, and French's Horticultural, and all produced markedly greater yields than any of the Low's Champion stocks and appeared to be more tolerant to halo blight. The variety termed Red Cranberry has been outstanding in several years' trials at Highmoor. A comparison of samples canned from the various varieties indicated that the product from Red Cranberry is sufficiently similar to Low's Champion to justify more extensive trials to determine if this variety cannot well be substituted for Low's Champion by the Maine canning industry. Canned samples of Flash, Brilliant, and French's Horticultural were of good quality and appearance. Flash and Brilliant have more pronounced red markings on the pods and beans than the French's Horticultural and should be especially attractive for roadside markets. Chinese Jumper, although vigorous and high yielding, was not attractive when canned.

SNAP BEAN TRIALS. Russell M. Bailey. Eighteen varieties of stringless beans were grown in replicated comparative plots at Highmoor in 1944. Commonly used wax and green varieties were included along with new varieties developed at the Maine Station and new ones received from Dr. Wade of the U. S. Department of Agriculture. Of the green beans, Keystonean and Stringless Green Pod were high in yield but too variable in pod characters to recommend for use by the canning industry. Full Measure and Tendergreen were very satisfactory considering type, yield, and uniformity. Logan, a new variety received from the U. S. Department of Agriculture, appeared well worthy of trial by Maine canners. Its yielding ability could not be evaluated because of reduced plant stand in the plots but the pods were straight, attractive and uniform. Maine No. 400, a round podded, white seeded green selection from the cross Hercules x Conserva, was notably outstanding in straightness and length of pod. It appeared to be several days earlier in maturity than Full Measure or Tendergreen. It is planned to increase the seed for more extensive testing in cooperation with Maine canners.

Rogers' Sensation Wax No. 1 compared favorably with Round Pod Kidney Wax and Pencil Pod Black Wax in yield and was outstanding in the production of small, uniform, slender pods that should make an attractive pack. The small and many curved pods may be objectionable from the standpoint of picking costs. Round Pod Kidney Wax was superior to Pencil Pod Black Wax in uniformity and produced longer pods of smaller diameter.

MEXICAN BEAN BEETLE CONTROL. John H. Hawkins. Beans at Highmoor Farm grown in replicated plots were treated with insecticides in dust form for the control of the Mexican bean beetle during 1944. The beans were harvested as green beans and weighed in order to compare yields obtained from plots receiving the different treatments. The yield of green beans harvested from the different plots and the materials used are recorded in Table 78.

TABLE 78

Yields of Bean Plots at Highmoor Farm—1944—When Treated with Insecticides to Control Mexican Bean Beetle

Materials used	Yield in pounds of green beans
Calcium arsenate, monohydrated copper sulfate and high calcic lime	61.7
Calcium arsenate, insoluble copper and high magnesian lime	58.6
Calcium arsenate, monohydrated copper sulfate, and high magnesian lime	57.8
D.D.T. 3%, remainder inert dust	54.7
Calcium arsenate and high magnesian lime	50.5
Calcium arsenate, insoluble copper, and high calcic lime	41.0
Calcium arsenate and high calcic lime	34.0

The use of calcium arsenate, monohydrated copper sulfate, and high magnesian lime on beans resulted in an average increase in yield of 18 per cent over the same mixture except that high calcic lime was substituted for the high magnesian lime. During the same period the use of calcium arsenate, monohydrated copper sulfate, and high magnesian on beans resulted in an average increase of 19.2 per cent over beans receiving no treatment.

CORN

FIELD CORN TRIALS. Russell M. Bailey, Eugene C. Ogden. The trials with field corn for the past several years have served to emphasize the need for adapted early maturing hybrids as several new hybrids have consistently been markedly superior in yield and plant characters compared to native strains of flint corn commonly grown. The most promising material has been hybrids and breed-

ing stocks that were courteously furnished by the Wisconsin Agricultural Experiment Station. Two of the flint-dent double crosses have been made available in limited quantities to farmers in this area under the names Maine A and Maine B. Although the Maine A has been slightly earlier in maturity, the Maine B is more uniform, is of better ear type and husks more readily. Yields of these two have been nearly the same in several years' trials.

The Maine B (Wis. No. 240) hybrid has yielded an average of 66.9 bushels of well matured, air dry corn per acre over a seven-year period in the plots at Highmoor Farm, Monmouth. In comparison to native flint strains this flint-dent hybrid has consistently matured almost as early and has been markedly superior in yield. The increased yield has ranged from 19 to 60 per cent with different seasons. The ears are borne at good height on stalks averaging 7 feet or more. There is less trouble from lodging and ear breakage than with native flints which permits leaving the crop on the stalks until late in the fall when the ears can be husked as picked with the aid of a husking hook or pin. The plants are vigorous enough to provide good silage yields if the crop is desired for this use. Varieties like Cornell 29-3 or Cornell 11 produce greater tonnage for silage but are too late to mature the ears satisfactorily for grain under most Maine conditions.

Twenty-nine varieties were in trial at Highmoor in 1944. The dry conditions prevailing at planting caused considerable plot variation in yield. The following varieties or hybrids were considered sufficiently early maturing to be of interest in Maine and are listed in order of maturity season together with the 1944 yield in bushels per acre of air-dry corn; Maine Flint (48), Maine A (64), Maine B (70), Kingscrot KF 13 (72), Haney Strain Minnesota 13 (49), Wisconsin 279 (61), Cornell 11 (56), and Minnesota 800 (60).

INVESTIGATIONS OF THE EUROPEAN CORN BORER (*Pyrausta nubilalis* Hbn.). John H. Hawkins. The severest infestation by the European corn borer of corn varieties in over 600 plots maintained during 1944 occurred to corn which reached the silking stage (50 per cent silk) between the dates of July 30 and August 6 inclusive. Infestations of corn plants in the plots where the corn was in the silking stage from 62 to 71 days after planting, ranged from 20 to 37 per cent. The peak infestation occurred to corn in the silk stage on July 31. The infestation to corn silking after August 6

did not exceed 20 per cent in any of the plots. Infestation by the European corn borer did not exceed 10 per cent in any of the plots in which the corn was in the stage of 50 per cent silk after August 9. Infestation dropped rapidly in corn silking after August 9 and was practically negligible in those plots where silking occurred after August 14.

Moths of the European corn borers emerged in rearing cages at Highmoor Farm from July 2 to August 3. Adult European corn borer moths were taken at light traps from July 14 to July 19. All of the moths emerging in the cages completed but one generation and were probably of the one generation or univoltine strain.

Limited data as to varietal resistance of sweet corn to the attack by the European corn borer indicate that some varietal strains are not as heavily infested as are other strains. A certain amount of this apparent resistance may be due to the later silking and tasselling date of these particular varieties. Considerably more information is necessary before definite varieties can be recommended as resistant to the attack of the European corn borer in Maine. Nevertheless this line of investigation is promising.

The investigation of infested fields shows that as high as 13 per cent of the European corn borers present may be left in the stubble when the corn stalks are cut at a distance greater than 6 inches from the soil. This will vary with the time the stalks are cut and with the weather. In general, the earlier the corn stalks are cut and placed in the silo the greater the percentage of the borers which are removed from the field. Early maturing sweet corn removed from the field soon after harvest and before heavy frosts have occurred, and so cut that the stubble is not more than three inches in length, may contain as many as 97 per cent of the European corn borers. If this corn is then run through an ensilage cutter and placed in the silo where fermentation takes place, then practically all the corn borers contained in it are destroyed. Observations have shown that it is much easier to completely cover corn stubble by fall plowing than it is to cover the entire stalks which are sometimes left in the field. One of the chief sources of European corn borer infestation is from fields and gardens where the corn stalks are left standing. Another is from areas where corn stalks are not completely covered by soil during fall plowing.

A study of fodder corn shows that corn fed as fodder is a dangerous source of infestation by the European corn borer. Under ordinary conditions there are about seven times as many of the European corn borers in a good sized shock of corn fodder as there are in the area containing the stubble from which the corn included in the shock was cut. When this corn fodder is fed around pasture lots or barns the corn borers are a source of infestation unless all the corn remains, not eaten by livestock, are carefully cleaned up and destroyed.

SWEET CORN BREEDING AND CANNING VARIETY TRIALS. Russell M. Bailey, Eugene C. Ogden. *Sweet Corn for Canning*. The primary aims in the development of superior sweet corn for the Maine canning industry are: maturity sufficiently early for Maine conditions, uniformity of maturity, vigorous growth, high yield of cuttable corn, and narrow, deep kernels of superior quality.

Several new hybrids, as yet unnamed, appear to be superior to the hybrids now commercially grown. Several of these were produced in sufficient quantity for more extensive trials during 1945. Some of these have as one parent the familiar Purdue 1339, others have a newly developed inbred line, named Maine No. 2, which shows promise in the production of earlier maturing hybrids.

Basic work on foundation stocks is being given much emphasis in the breeding program. Over 200 inbreds are being compared, improved, and used in determining their behavior in crosses.

In Table 79 is presented a summary of the performance of selected sweet corn hybrids of importance for canning that have been in trial at Highmoor Farm, Monmouth, Maine, for at least the last three years (1942, 1943, and 1944) and in most cases for seven, eight, or nine years. Burnell Golden Bantam, one of the open pollinated Golden Bantam strains formerly widely used for canning, is included as a check so that the hybrids may be compared with it.

Explanation of table. *Relative earliness*. The hybrids are arranged according to earliness based on the number of days from planting to the time when 50 per cent of the plants show silks. The number of days to midharvest is also given. The latter figures are probably less accurate for determining relative earliness because of the difficulty of harvesting all plots at exactly the same stage of maturity.

TABLE 79
Performance of Canning Type Sweet Corn—Highmoor Farm—1936-1944

Variety	Relative earliness		Compara- tive yield (%)	Plant ht. (in.)	Ear wt. (lb.)	Ear lgth. (in.)	Ear diam. (in.)	Kernel width	Per cent of ears in row classes					Quality		
	Days to 50% silk	Days to mid- harvest							8	10	12	14	16	18+	Fla- vor	Tender- ness
Seneca Golden	66	95	133	71	.56	6.1	1.79	2.5	5	20	66	8	1		2.1	2.1
Carmelcross	66	101	142	72	.68	6.0	1.91	2.0		2	66	25	7		2.0	1.9
Early Topcross	67	100	123	71	.57	5.6	1.80	1.7		2	42	32	22	2	2.0	1.8
Burnell Golden Bantam	67	100	100	72	.51	5.4	1.82	1.5		1	20	26	35	18	2.2	1.5
Hybrid F	70	102	149	80	.66	6.3	1.80	1.8	2	11	67	18	2		2.2	2.5
Maine Topcross	70	103	131	81	.58	5.8	1.81	1.4		1	24	40	29	6	2.1	2.1
Hybrid O	70	104	148	82	.63	6.5	1.78	1.5	1	6	60	29	4		2.2	2.2
Tendergold	70	104	140	79	.66	6.2	1.82	1.8		8	56	26	8	1	2.2	2.1
Hybrid H	70	105	150	81	.67	6.6	1.85	1.5	1	2	39	34	23	2	2.1	2.2
Hybrid G	71	104	158	80	.63	6.4	1.81	1.2		2	56	34	8		2.7	2.3
Topcross Maine Bantam (Associated)	71	104	131	77	.61	6.1	1.82	1.4		5	50	32	11	2	2.4	2.1
Maine Tricross	71	105	151	75	.63	6.0	1.80	1.5	1	4	47	30	16	2	2.3	2.3
Hybrid D	71	106	161	80	.69	6.6	1.83	1.4		1	48	33	17	1	2.2	2.3
Hybrid E	72	106	163	80	.67	6.3	1.83	1.3	1	2	43	34	19	1	2.2	2.1
Golden Cross	74	108	129	80	.57	6.2	1.74	1.5	4	18	67	10	1		2.6	2.5

Comparative yield. The yield is based on the weight of snapped ears in the husk and is given in per cent of the yield of Burnell Golden Bantam.

Plant height. Average in inches from the soil level to the tip of the tassel.

Ear weight. Average weight in pounds per ear in husk.

Ear length. Average length of cuttable corn in inches.

Ear diameter. In inches at butt.

Kernel width. 1 = fine or narrow, 2 = medium, 3 = broad.

Per cent of ears in row classes. Self explanatory.

Quality. Flavor and tenderness ratings based on tastings of fresh uncooked ears. For flavor, 1 = good or sweet, 2 = medium, 3 = poor. For tenderness, 1 = tender, 2 = medium, 3 = tough. For many reasons, quality ratings are difficult to obtain with any degree of accuracy.

Availability of seed of the listed hybrids. Seneca Golden, Carmelcross, Tendergold, Topcross Maine Bantam (Associated), and Golden Cross Bantam can readily be obtained from the well-known seed firms. Early Topcross, Maine Topcross, Hybrid C and Maine Tricross are available in commercial quantities from the Maine Cannery Association Seed Committee (Karl K. Soule, Secretary, 256 Commercial Street, Portland, Maine). Seed of Hybrids D, E, F, G, and H is available in small quantities for trial from the Maine Cannery Association Seed Committee.

GARDEN SWEET CORN TRIALS. Russell M. Bailey, Eugene C. Ogden. About 200 sweet corn hybrids and varieties were compared at Highmoor Farm in 1944. Twenty-nine of these that appeared to have promise for home and market gardens were given rigid tests to determine their suitability in Maine gardens.

Northland is recommended for northern and eastern Maine, where later maturing varieties might not mature, and as a first early type for central Maine. At Highmoor Farm in 1944 this hybrid matured for the table in 77 days; that is, from the date of planting to the date of midharvest.

Other suitable early and midseason varieties, with days to midharvest in central Maine based on 1944 tests, are: Spancross (77), North Star (79), Early Golden 1.13 (80), Marcross (80), Seneca Golden (82), and Carmelcross (84). Later varieties that will mature in central Maine are: Tendergold (88), Lincoln (90), and Golden Cross (91).

CUCUMBER

BREEDING SCAB RESISTANT CUCUMBERS. Russell M. Bailey, Donald Folsom. Cucumber scab (*Cladosporium cucumerinum*) frequently causes severe damage to the cucumber crop in both home garden and in commercial plantings. Maine No. 2, a highly resistant variety developed several years ago by the Maine Station, is becoming increasingly popular where scab is troublesome. Heretofore because of its type and color, Maine No. 2 has been recommended only for home garden use but last year several acres were grown for commercial pickling and found to be satisfactory. It is not of suitable type for the market grower who demands a long-fruited dark green cucumber. A new resistant slicing type selection has been widely distributed among growers for evaluation to meet this need.

PEAS

PEA APHID INVESTIGATIONS. John H. Hawkins. Insecticides applied to peas at Highmoor Farm were evaluated on the basis of the number of aphids present the afternoon before treatment, the day of treatment, and each day afterward for 5 days. Counts of aphids were made from 50 blossom heads for each treatment and the check for each replication. Plots were arranged at random in replications of 10 for each treatment and for the check. The insecticides were applied July 12.

The best control was obtained in the plots in which the peas were treated with a dust containing nicotine and rotenone (Table 80). The percentage of control at the end of 6 days was 96.6 per cent and somewhat better than in the other treated plots. During the 6-day period aphids had increased in the untreated check plots and had caused extensive injury to the peas.

SEED TREATMENT FOR PEAS PROVES BENEFICIAL. Russell M. Bailey, Donald Folsom. Treatment of seed peas with Spergon was found to be highly beneficial at Highmoor in 1943 and 1944. A greenhouse experiment conducted in 1944 using soil from the same field gave a marked increase in plant stand due to treatment with either Arasan or Spergon when used with soil heavily infested with fungi that attack the seed or young plants. No benefit

TABLE 80

Number of Pea Aphids Present on Peas Treated with Insecticides

Insecticides	July					
	11	12	13	14	15	16
Nicotine 2 per cent Rotenone .5 per cent Remainder inert dust	1577	217	89	33	80	98
Rotenone .25 per cent Lethane 3 per cent Remainder inert dust	1110	555	388	221	520	383
D.D.T. 3 per cent Remainder inert dust	1398	360	308	277	248	405
Check plots	1093	978	1426	1566	2058	2942

from seed treatment was observed with pots of sterilized soil. With the heavily contaminated soil, emergence percentages were 11.5 with untreated seed, 44.5 when seed was treated with Arasan, and 52.0 when Spergon was used. The percentage differences between treated and untreated lots were found to be highly significant but the difference between Arasan and Spergon treatments was not statistically significant.

As a result of the above work, it was recommended that Maine canners use Arasan, Spergon, or some equally effective fungicide to treat seed for a portion of their 1944 plantings. About one-third of the pea acreage in central Maine was planted to treated seed. In many cases separate parts of fields were planted with treated and untreated seed. During the summer five such fields were examined in order to determine any possible effect of seed treatment on plant stand and on nodulation. Unfortunately no comparative yield records were obtained due to wartime pressure at harvest but field examinations appeared to justify the following conclusions:

1. The use of Spergon or Arasan improved the plant stand and vigor of peas in the early stages of growth in the pea growing area of central Maine in 1944.
2. There was no evidence to indicate that seed treatment was harmful to nodulation. This was also confirmed by a study of nodulation on pea plants grown from treated and untreated seed in sterilized soil under greenhouse conditions.

3. Field inspections revealed that many pea fields are injured by root rot, thought to be due to attacks by *Rhizoctonia*. This may be aggravated by short rotations with potatoes, and the use of longer rotations including grass crops might be helpful. The use of seed peas treated with Spergon or some similar fungicide is recommended to alleviate the trouble by improvement of plant stand and plant vigor in the early stages of growth.

4. Although seed treatment has been found to promote better plant stands and early vigor, the benefit is of short duration as plants grown from treated seed were observed to be severely attacked by fungi in late stages of growth in some fields. The use of seed fungicides may enhance the prospects of a good crop early in the growing season, but the ultimate crop is dependent upon many other factors concerned with management, climate, and soil.

SMALL GRAINS

VARIETY TRIALS. Ferdinand H. Steinmetz, Russell M. Bailey, Joseph A. Chucka, Charles H. Moran. Small grain variety trials were conducted at Aroostook Farm and at Highmoor Farm in 1944. The growing conditions were fair to good for small grains in Aroostook County. Cereal crop diseases were scarcely evident at Aroostook Farm. The relatively low rainfall reduced the yields over those of 1943. At Highmoor Farm (Kennebec County) the 1944 season was abnormally dry particularly during May and the first half of June. Rust (probably crown rust) was prevalent again and undoubtedly caused marked yield reductions in susceptible varieties, particularly in the late planted series of plots.

Trials at Aroostook Farm. **BARLEY.** Eighteen varieties of barley (Wisconsin x 182-8-37, Byng, Ezond, Aberdeen-Idaho 109, Idaho 5652, Velvon, C.I. 7115, C.I. 7116, Barbless, Mich. 07930, Alpha, Aberdeen-Idaho 6127, Mars, Tregal, O.A.C. #21, Velvet, Minn. II-31-19, and Glacier) were included in the small grain variety trial at Aroostook Farm. The 1944 yields per acre ranged from 25 to 45 bushels. The varieties ranked in yield in descending order as given above.

OATS. Eight varieties of oats (Eagle, Maine 340, Erban, Sun, Vicland, Gopher, Marion, Sac) were included in the small grain variety trial at Aroostook Farm. The 1944 yields per acre ranged

from 48 to 75 bushels. The varieties ranked in yield in descending order as given above. An additional 25 varieties of oats, supplied by T. R. Stanton, U. S. Department of Agriculture, were grown at Aroostook Farm. Triplicate, randomized three-row plots were planted of each variety of which the middle rows were harvested for yield. The yields obtained ranged from 44 to 70 bushels per acre.

WINTER WHEAT. Six varieties of winter wheat (Marmin, Yogo, Minn. 2713, Minturki, Minhardi, Minn. 2714) were included in the small grain trial at Aroostook Farm. The seed was sown September 1, 1943. The 1944 yields per acre ranged from 26 to 33 bushels of high quality wheat. The varieties ranked in yield in descending order as given above. Winterkilling was negligible.

SPRING WHEAT. Eight varieties of spring wheat (Diamond, Garnet, Regent, N.S. 2829, Minn. 2682, Premier, Renown, N.S. 2822) were included in the small grain trials at Aroostook Farm. The 1944 yields per acre ranged from 20 to 28 bushels. The varieties ranked in yield in descending order as given above.

Trials at Highmoor Farm. OATS. A comparative trial of 35 oat varieties was conducted at Highmoor Farm, Monmouth, Maine, in 1944 in order to evaluate their worth for use in southern and central Maine. Most of the varieties are new ones and were kindly furnished by T. R. Stanton of the United States Department of Agriculture. As a result of two years' investigations, it appears that rust is a more serious problem in southern Maine than in northern Maine. Oats are frequently planted late in the southern part of the State and for this reason both an early and late planting of the varieties was made in order to observe varietal performance and to study the effect of late vs. early planting in general.

The early planting was made on May 24th. The varieties were in 5 randomized blocks of single-row 20-ft. plots. The row spacing was 18 inches to facilitate weed control which probably reduced the per acre yield as compared to normal spacing. The average yield per acre for all varieties in both seedlings was 47.5 bushels for the early planting. The named varieties ranged in yield from 65.9 bushels to 38.8 bushels in descending order as follows: Ajax, Upright, Victory, Erban, Maine 340, Tama, Sac, Vanguard #7, Clinton, Vicland, Marion, Boone, and Gopher. In general, with the early planting, the long season varieties yielded more than did the shorter season ones.

The later planting was made on June 8th with only two plots of each variety. The average yield in this case was 38.4 bushels per acre or 9.1 bushels per acre less than for the same varieties in the May 24th seeding. The varieties in this case ranked in descending order as follows: Clinton, Sac, Boone, Tama, Erban, Ajax, Vicland, Marion, Gopher, Vanguard #7, Maine 340, and Upright. With the late seeding, the short season varieties generally were superior in yield and straw strength. The first four listed are apparently highly rust resistant as no rust symptoms were recorded on these in either the May 24th or June 8th seeding.

BARLEY. Ten varieties of barley were under observation at Highmoor in 1944. Three of them, Velvet, Glacier, and Mich. 07930, did not appear to be adapted to conditions prevailing at Highmoor last season and were not harvested. The following varieties arranged in descending order of 1944 yield appear worthy of further trial: (smooth awned) Tregal, Mars, Byng, Ezond, and (rough awned) Alpha. The average yield for these varieties was 44.4 bushels per acre.

SEED OATS TREATMENT TO CONTROL SMUT. Ferdinand H. Steinmetz. Greenhouse tests for the control of oat smut was made with Stanox P, Stanox 15, and Sinox Powder 6605. Improved Ceresan was used as a standard control. The untreated seed oats produced 35 per cent smutty plants. Sinox Powder 6605 was effective as a smut control when used in excess ($\frac{1}{2}$ oz. per 4 oz. oats) in dilutions up to 1 part of the powder in 2 parts of talc but the viability of seed oats was lowered from 15 to 20 per cent. The undiluted powder also was effective but it reduced the viability as much as 40 per cent. Improved Ceresan used according to manufacturers' directions gave complete control. Sinox P and Sinox 15 were less effective than Sinox Powder 6605.

TOMATOES

TOMATO VARIETY TRIAL AT HIGHMOOR FARM. Russell M. Bailey. Sixteen varieties of tomatoes were in trial at Highmoor in 1944. Although the plants were not set until June 7th, the comparative performance does provide an index of their adaptation to central Maine conditions. Many were new varieties that are not well known at present. Such varieties as John Baer, Marglobe,

Pritchard and Stokesdale are known to perform well under market growers' conditions, particularly in southwestern Maine. The fruits are large, firm, and attractive. Where firmness and large size are not as important as for home use, it may be preferable to sacrifice some of these qualities in order to obtain a larger crop of ripe fruits. In such cases some of the new early varieties merit trial.

Two selections developed at the Maine Station by Iva Burgess are of interest. F.N.C although small fruited is meeting approval in northern and eastern Maine because of its outstanding earliness. It is especially valuable for the home garden because it carries relatively high vitamin C content which makes it a desirable variety for home canning or for juice. Selection 85 is earlier maturing than most varieties tested, produces medium sized, very smooth attractive fruits. Selection 85 deserves further trial throughout central Maine.

Hybrid tomatoes obtained by crossing some of the better varieties have been outstanding in performance over several years' trials compared to their parent varieties in both earliness and yield.

TABLE 81

Summary of Highmoor Farm Tomato Trials—1944

Variety	Yield lbs. per plant		Average fruit weight oz.	% Market- able	Firmness
	August	To Sept. 23			
F.N.C	2.5	6.5	1.8	78	M
Selection 85	1.6	7.2	3.0	90	F+
Pennheart	1.5	4.5	5.3	60	M
Bounty	1.5	6.4	4.9	80	M
Danmark x Pritchard	1.5	8.7	3.2	72	M+
Victor (Robson)	1.2	8.3	4.7	73	M+
Sioux	0.9	5.7	3.9	78	M+
Red Cloud	0.8	5.6	4.6	81	M
Burpee 3300	0.7	7.2	3.5	50	M
Danmark	0.7	5.3	2.2	76	M-
Coventry	0.5	7.2	3.3	60 ¹	F
Charter Oak No. 3	0.5	6.0	3.9	66 ¹	F
Pritchard	0.5	4.7	4.9	67 ¹	F
Stokesdale	0.5	3.8	4.1	41 ²	F
Stemless Penn Orange	0.7	1.9	5.6	66 ²	F+
Stemless Penn Red	0.4	2.0	5.4	44 ²	F+

Plants set June 7. Distance 3 x 6 ft. Two plots of each variety in systematic arrangement. Five plants in each plot.

Firmness. M = medium, F = firm.

¹ Much cracking in period September 10 to 23 affecting marketable per cent of late varieties.

² Fruit tears badly when picked. Bad stem scars.

Unfortunately hybridized seed is difficult and expensive to produce and more study is needed on practical methods of producing such seed before growers can extensively benefit from hybrids. One cross, Danmark x Pritchard, was included in the trial and its performance is shown in Table 81.

GARDEN CROPS IN NORTHERN MAINE

ADAPTABILITY. Elizabeth F. Murphy, Ferdinand H. Steinmetz. The maintenance of home gardens and the production of vegetables and fruits for home use is a desirable corollary to the improvement of nutritional status. This is of especial importance during the war emergency or during a time of disrupted distribution of food. A knowledge of climatic, soil, and fertilizer requirements of food crops, as well as those of nutritional values, is of significance. The short growing season which is characteristic of northern Maine poses a real problem in selecting varieties of certain crops which will mature early enough to produce significant yields to the grower. Tomatoes and sweet corn are receiving emphasis in the trial gardens because the usually recommended commercial varieties of these crops require a longer growing season than is typical of the region.

Northern Aroostook. Two experimental tomato plots were planted on farms in the St. John River Valley.¹ Eight plants of each of 12 varieties of reputedly early maturing tomatoes were included. The season was favorable for tomato growth, and satisfactory records were obtained from one plot. The yields are reported in Table 82. Only the numbers and weights of ripe fruit harvested before September 15 are shown because frost ordinarily strikes at about that date. Yields prior to September 1 are also tabulated as these earlier-maturing varieties would obviously be preferable in an area characterized by a short growing season.

Of the twelve varieties, four produced over 3 pounds of ripe fruit per plant before September 15 with F.N.C. yielding almost 4 pounds. Michigan 4502 and Early Dwarf gave the largest yields before September 1, the former 1 pound and the latter 1.3 pounds per plant. Of the high-yielding varieties, F.N.C. and Early Dwarf

¹ Grateful acknowledgment is made to Mrs. Elizabeth Sirois for cooperation in arranging for the plots and to Mrs. Aldrich Masse for records.

TABLE 82

Yield Ripe Tomato Fruit Per Plant in Van Buren—1944

Data from 8 plants of each variety

Variety	Before Sept. 1		Before Sept. 15	
	Number ripe fruit per plant	Weight ripe fruit per plant	Number ripe fruit per plant	Weight ripe fruit per plant
		pound		pound
Best of All	.1	.03	6.2	2.0
Bison	3.2	.6	13.8	3.5
Bonny Best	1.1	.3	2.8	.6
Bounty	3.0	.7	6.9	1.6
Early Danmark	4.1	.7	20.2	3.1
Early Dwarf	13.0	1.3	24.0	2.2
Early Trellis	.4	.1	5.2	.9
F.N.C.	4.8	.5	37.4	3.9
Michigan 4502	5.9	1.0	19.4	3.6
Trellis 22	.9	.2	4.0	.7
Redskin	5.6	.7	14.2	1.8
Waltham Forcing	.5	.1	7.1	1.5

contained the largest amounts of vitamin C, Early Danmark was medium, and Bison and Michigan 4502 on the lower level. These studies on tomato varieties are being continued during 1945 with some substitutions for the varieties which were observed to be poorly adapted to the conditions in the region.

Central Aroostook. For the third year a vegetable garden was grown at Aroostook Farm, Presque Isle. This included 3 varieties of tomatoes, each represented by 192 plants, 4 of sweet corn, 2 of lettuce, 2 of carrots, 2 of rutabaga, 1 of kale, and 4 of cabbage.

TABLE 83

Ripe Tomato Yield from 192 Plants—Presque Isle—1944

Total to date	F.N.C.				Best of All				Waltham Forcing			
	No.	Wt. lb.	Yield per plant		No.	Wt. lb.	Yield per plant		No.	Wt. lb.	Yield per plant	
			No.	Wt. lb.			No.	Wt. lb.			No.	Wt. lb.
17 August	214	9	1.1	.1	19	2	.1	.01				
1 Sept.	1322	120	6.9	.6	290	30	1.5	.1	53	7	.3	.08
15 Sept.	4238	398	22.1	2.1	1135	131	5.9	.7	346	55	1.8	.3
26 Sept. end of season	11893	1091	1.5	5.7	5059	727	26.3	3.8	2995	572	15.6	3.0

Records of yields and observations on maturity, incidence of disease, and adaptability were made on all crops.

Tomatoes were grown successfully on the Presque Isle plots in 1944 with F.N.C maintaining its superiority over the other 2 early varieties. F.N.C yielded 2.1 pounds of ripe fruit per plant before September 15 and 5.7 pounds per plant (approximately 10 tons per acre) at the end of the season (September 26). Best of All produced .7 pound and Waltham Forcing only .3 pound of ripe fruit before September 15 and 3.8 and 3.0 pounds respectively by the end of the season. The progressive yields according to dates are shown in Table 83.

Comparative data over a period of 3 seasons (2 favorable and 1 adverse) for tomato production in Presque Isle are reported in Table 84. In 1943, F.N.C yielded .79 pound and in 1942, 4.5 pounds per plant. All the varieties were selected for earliness and high vitamin C. The only criticism of the F.N.C tomato has been its relatively small size (1.5 to 2.0 oz.). This is not a serious handicap to the consumer who uses tomatoes fresh or as juice. Smallness in tomatoes is a time-consuming impediment to the housewife who cans tomatoes whole. The advantages of large early yields and of high vitamin C characteristic of F.N.C, however, outweigh the disadvantage of small size.

Figures representing the production of other garden crops in Presque Isle are given in Table 85. The Northland hybrid sweet corn is worthy of note. This variety represented by 672 plants yielded 706 ears of corn (average weight .294 pound), whereas three other so-called early varieties did not mature.

CONTROL OF LATE BLIGHT ROT IN TOMATOES GROWN IN AROOSTOOK COUNTY. Reiner Bonde. There is a considerable amount of interest in Aroostook County in the growing of tomatoes for home garden use. One of the limiting factors in the growing of tomatoes in northern Maine is the control of decay caused by the late blight or "rust" fungus which also commonly attacks potatoes.

Late-blight rot of tomato is so prevalent most seasons in Aroostook County that it is practically impossible to raise a good crop of ripe fruit unless the plants have been thoroughly sprayed with a fungicide.

On Aroostook Farm dusting the plants with a copper lime dust has been less effective in controlling the disease than have the cop-

TABLE 84

Yields Ripe Tomatoes Per Plant—Presque Isle—1942 to 1944

Data from 192 plants of each variety

Date	F.N.C.			Waltham Fording			Best of All			Bounty		
	# ripe fruit per plant	Wt. ripe fruit per plant	Average wt. of fruit	# ripe fruit per plant	Wt. ripe fruit per plant	Average wt. of fruit	# ripe fruit per plant	Wt. ripe fruit per plant	Average wt. of fruit	# ripe fruit per plant	Wt. ripe fruit per plant	Average wt. of fruit
		lb.	oz.		lb.	oz.		lb.	oz.		lb.	oz.
1 Sept. 1942	8.1	.9	1.8	1.2	.3	3.4						
1 Sept. 1943	0.5	.06	1.9	.1	.01	3.2	.1	.03	4.0	.3	.1	5.7
1 Sept. 1944	6.9	.6	1.4	.3	.03	2.0	1.5	.2	1.7			
End of Season												
26 Sept. 1942	40.4	4.5	1.8	13.9	2.8	3.3		.6	3.5		3.6	4.7
17 Sept. 1943	6.3	.79	2.0	.5	.5	3.7	2.8	.6	2.3	12.2		
26 Sept. 1944	61.9	5.7	1.5	15.6	3.0	3.1	26.3	3.8				

TABLE 85

Yield of Vegetable Varieties Grown at Aroostook Farm—Presque Isle—1944

Variety	No. of plants	Wt. in lbs.	Av. wt. of plant
Cornell Early Cabbage	294	356	1.2
Green Acre	289	1297	4.5
Bugner Ballhead	281	1755	6.2
Perfection Drumhead	304	1013	3.3
Nantes Coreless	1849	297	.16
Chantenay	1692	348	.21
L.I. Improved	613	1178	1.9
Macomber	645	1582	2.5
Northland	706	208	.29
Early Yellow Sensation	No yield		
Golden Gem	No yield		
Early Sunshine	No yield		
Lettuce	Failure		

per spray fungicides. In 1941 and 1942 plants that were dusted with copper lime dust yielded nearly 30 per cent rotted fruit in contrast to no decay from plants that were sprayed with Bordeaux mixture.

It is generally recommended that tomato plants should be sprayed with a neutral copper material because Bordeaux may cause the flowers to drop and a delayed ripening of the fruit. At Presque Isle excellent results have been obtained by spraying the plants with a half strength Bordeaux. The first spray applications were made when the disease had become prevalent in the potato fields and the conditions were favorable for the rapid spread of the disease. More fruit decay has occurred from plants that received spray applications of the neutral copper than where Bordeaux mixture was used.

It was observed at Aroostook Farm that there is a difference in the relative susceptibility of the different varieties to decay caused by the late blight fungus. During 1941 only a few fruits of the Bounty variety developed the decay in contrast with nearly a complete loss because of decay in the Bonny Best variety. The fruits of the Early Danmark variety also appeared to be less subject to late-blight decay than did those of the Bonny Best variety. A test conducted in 1943 by Dr. E. S. Schultz showed that late-blight decay was more prevalent in the Bonny Best variety than in the Early Danmark variety.

During 1944 a preliminary test was conducted at Aroostook Farm to gain additional information regarding the relative susceptibility of five varieties to late-blight decay. Sixteen plants of each variety were planted in a randomized plot. The plants received no fungicidal spray applications. Records were obtained regarding the yield and the earliest date the different varieties produced ripe fruit. Observations also were obtained of the amount of decay that developed. The data secured from this experiment have been summarized in Table 86.

TABLE 86

Comparative Yield of Ripe Tomato Fruit from Different Varieties Grown at Aroostook Farm, Presque Isle, Maine—1944

Variety or cross	Date of earliest ripe fruit	Total yield ¹	Average yield per plant	Ripe fruit per plant for season
		Pounds	Pounds	Number
Early Denmark	August 6	80.0	5.00	38.5
Early Denmark x Pritchard F ₁	August 13	61.5	3.84	19.6
Bonny Best	August 13	54.0	3.38	17.3
Victory	August 13	68.0	4.25	15.5
Bounty	August 16	61.2	3.83	14.1

¹ Yields were secured from 16 plants for each variety planted in a randomized plot.

Late blight was absent from the tomato test plots and no decay caused by the fungus was found. Although late-blight decay did not occur in these experiments, certain data of interest were secured which are here recorded.

The Bonny Best variety was very susceptible to a bacterial soft-rot decay which was absent in fruits of the other varieties. A cracking of the ripe fruit also was prevalent in the Bonny Best variety which resulted in a considerable amount of decay.

It may be observed from the data in Table 86 that Early Denmark was the first to produce ripe fruit and also gave the highest yield rate, namely 5 pounds per plant. The fruits, however, were rather small as may be noted from the data in Table 86. The Victory variety yielded 4.25 pounds per plant or only .75 pound less than did Early Denmark and ripe fruit developed only seven days later. It would appear from these data that this variety would merit further trial in Aroostook County.

Bounty has plant and fruit characteristics that are very similar to those of Victory and has been recommended for the northern states. However, at Aroostook Farm, this variety was inferior to Victory. Bounty produced smaller fruits which were later to ripen and inferior to those that were produced by Victory.

Bonny Best is considered to be the standard variety by many home gardeners and has produced very good quality fruit at Aroostook Farm. It, however, is too late maturing for northern Maine and is very susceptible to decay caused by the late-blight fungus and other organisms. Observation and the testing of a number of varieties make it appear that earlier varieties can be selected that are adapted for use by the amateur gardener of Aroostook County. It also appears that varieties can be secured that will be highly resistant to late-blight decay.

WEEDS

CONTROL OF NORTHERN NUTGRASS. George P. Steinbauer, Herbert A. Leonard. Continuation of the herbicide tests for control of northern nutgrass, *Cyperus esculentus* L., previously reported in 1944 again gave the most effective control with ammonium thiocyanate spray 1 pound to a gallon of water. Greenhouse tests indicate that for the purposes of complete soil sterilization for control of spot infestations at least 15 pounds of borax per square rod is needed. The rate of killing was increased by addition of 5 pounds of Atlacide per square rod in addition to the borax. Use of Japanese millet as a smoother crop reduced the stand and vigor of nutgrass plants but did not completely eliminate them.

Germination tests² on inflorescences showed as high as 1,235 viable seeds per inflorescence which indicates that seed formation must be taken into account along with spread of tubers as sources of infestation of this weed.

CONTROL OF WOUNDWORT. George P. Steinbauer, Ferdinand H. Steinmetz. Copper sulfate (5%), Dowspray "66" (1 pound to 10 gallons), Sinox (1% + $(\text{NH}_4)_2\text{SO}_4$ activator), Ammonium thiocyanate ($\frac{1}{4}$, $\frac{1}{2}$, 1 pound per gallon) and Ammonium sulfamate ($\frac{1}{4}$, $\frac{1}{2}$, and 1 pound per gallon) were used as herbicide

² The seeds were collected at Fryeburg, Me. Germination tests were run by Dr. O. L. Justice, Federal Seed Laboratory, Washington, D. C.

sprays on woundwort, *Stachys palustris* L. Of these, ammonium thiocyanate and ammonium sulfamate were most toxic to the plants. Two applications of either of these chemicals (1 pound to a gallon of water) should eliminate spot infestations.

Use of a fallowvator at biweekly intervals appears effective on larger areas. Buckwheat, fertilized with 50 pounds of N per acre offers promise of materially reducing stands of this weed and weakening the plants which do survive.

PUBLICATIONS

Further information on any of the research of the Station may be obtained by writing to the individuals in charge of the various studies. Publications of the Station will be sent free upon request. Recent publications are:

Bulletin No. 431. The Mexican Bean Beetle in Maine.
Misc. Publication 602.* Eradication of Certain Maine Weeds.

FORESTRY

Research in Forestry was officially included in the Station program on July 1, 1943. Studies were begun on various problems and these are continuing. The progress made in these studies is reported below.

MARKETS FOR FOREST PRODUCTS IN MAINE. Gregory Baker, Dwight B. Demeritt, Chauncey W. L. Chapman. The field work was completed on this project during the year. Preliminary reports were prepared for each county as soon as the field work was finished in that area. These reports contained a directory of the wood-using plants by kinds and tables showing species and quantity used in each one in 1942. In addition, considerable detail was shown relative to lumber mills, such as equipment, power units and classification as to amount of daily production. No data were included in the preliminary reports concerning pulpwood production.

The preliminary data are now being corrected and combined for publication in a bulletin. Pulpwood data have been added. A summary of the results follows:

Number of Industries. The survey indicated that there were a total of 956 wood-using plants in the State of which 149, or 15.6 per cent, were inactive at the time of the survey. These were divided as follows:

Sawmills	731
Turneries	79
Bolt mills	50
Shingle mills	41
Pulp and paper plants	26
Cooperage plants	22
Plywood mills	5
Pole operations	2
Total	956

Sawmills

Classification	Number	Per Cent	Per Cent of Lumber Sawed
Stationary mills	482	66	69
Portable mills	249	34	31
Total	731	100	100

Daily Capacity	Number	Per Cent	Per Cent of Lumber Sawed
0 - 4.9 M B.F.	225	30.8	5.3
5 - 9.9 M B.F.	322	44.0	36.0
10 - 19.9 M B.F.	168	23.0	46.6
20 - 39.9 M B.F.	10	1.4	5.5
40 - 59.9 M B.F.	4	0.5	5.7
60 - Over M B.F.	2	0.3	2.9
Total	731	100.0	100.0

Production. The following amounts of wood were *produced* in Maine in 1942 for use in the indicated industries. These production figures do not include the total mill *consumption* since considerable wood was imported from Canada and neighboring states during the period.

Industry	Production	Major Species Used
Pulp and paper	1,328,310 cords	64% spruce and fir
Sawmills	384,358,000 board feet	65% white pine
Turneries	143,886 cords	69% white birch
Bolt mills	30,008 cords	41% white pine, 33% white birch
Plywood	22,000,000 board feet	67% yellow birch
Crossties	228,970 pieces	100% cedar
Cooperage	7,800 cords	36% cedar, 35% white pine
Shingles	5,372 cords	95% cedar
Poles	40,772 pieces	43% cedar, 40% Norway pine

By use of conversion factors (1 cord = 500 board feet; 1 tie = $33\frac{1}{3}$ board feet; 1 pole = 40 board feet) the total production of wood products in 1942 was 1,173,342,000 board feet log scale.

WOOD FUEL BURNERS. Gregory Baker. A short test run was made with the patented stove in the fall of 1944 in a farm home in Somerset County where the previous test had been made. The severe creosoting conditions were again duplicated. Since expensive carpentry and masonry work was necessary to change the piping arrangement, it was decided to discontinue the test in this location. Search is being made for a farm home with a more favorable piping setup for this kind of a stove.

SERVICE LIFE OF MAINE WOODS FOR POSTS. Gregory Baker. The preferred wood for fence posts in Maine is the native northern white cedar (*Thuja occidentalis*) because of its durability in contact

with the soil, its light weight which makes for easy handling, and the ease with which staples can be driven into it. Some sections of the State are poorly supplied with cedar and many other species are used for fencing. Where on-the-spot repairs of fences are made, particularly in wooded areas, anything that is handy is likely to be used.

This project proposes to test in service ten common species of wood (5 hardwoods and 5 softwoods) and set up durability ratings for them. While some of the species, as for example the trembling aspen, are known to be of low durability they were chosen to emphasize the difference between low- and high-durability species. This length of service life will be further emphasized when it is reduced to an annual charge basis.

Five posts of each of the following species have been cut, peeled, and piled for seasoning: white pine (*Pinus strobus*), red spruce (*Picea rubra*), balsam fir (*Abies balsamea*), hemlock (*Tsuga canadensis*), northern white cedar (*Thuja occidentalis*), gray birch (*Betula populifolia*), trembling aspen (*Populus tremuloides*), red oak (*Quercus borealis*), beech (*Fagus grandifolia*), red maple (*Acer rubrum*). When these are ready for setting in the ground matching posts unseasoned and with the bark on will be cut and set with them. Additional posts will be set from year to year in order that good averages may be obtained.

When equipment and chemicals are available it is planned to butt-treat a series of posts with hot-and-cold bath of creosote and obtain further figures on durability and annual cost.

NORTHERN WHITE PINE PRODUCTION. James D. Curtis. A total of ten permanent sample plots in Oxford, Cumberland, Sagadahoc, Androscoggin, and Penobscot Counties were renovated and remeasured. A new one was established on the University Forest. In this way a representative sample of white pine production for the State was secured.

The principal results of these measurements and their analyses were that total production for a given period of time is greater in thinned stands than in unthinned stands with the added advantage of earlier returns from thinnings. Systematic periodic thinning maintains a good growth rate in white pine stands thus assuring a high volume in the residual stand. If stands are left unthinned, the stand stagnates and the bulk of the material which would be removed in thinnings dies, and is lost.

RED PINE SAWFLY. Charles O. Dirks, James D. Curtis. Details of the life history of the insect have been established although the specific name is still unknown. Three plantations were sprayed with calcium arsenate dust which successfully controlled the infestations. A 3 per cent concentration dust of DDT proved ineffectual. A remeasurement of the sample plot in the oldest plantation where the outbreak was originally found in 1940 showed that the defoliation was heavier than in 1943.

ARTIFICIAL REPRODUCTION. James D. Curtis. Final examination of the seed spots was made in 1944 since the dense growth of herbaceous vegetation made further examination unreliable. Final records of the broadcast sowing will have to be delayed for several years until the seedlings can be easily found. Results of the seed spotting tests show this to be unpractical on such sites due to the activities of mice and the action of frost heaving.

An amendment to this study has been initiated this year regarding Christmas tree production. Some 600 wildlings (seedlings from the forest) 2-10 years old have been transplanted in the nursery. A few tests of pH have been taken in the forest and nursery and it is planned to simulate forest conditions in the nursery in an effort to grow more satisfactory seedlings than have been grown in the past. The fact that no native seed has been used in the nursery before may, in itself, partly solve the problem.

ARTIFICIAL PRUNING. James D. Curtis. The pruning of red and Scotch pine by the "finger budding" method was continued and the measurement of pruned and unpruned trees made for comparison. Preliminary records indicate that the pruned trees make about .5 foot growth in height per year more than the unpruned trees. The leaders of some trees were broken off by spring winds with the result that numerous adventitious buds were formed, all but one of which were removed by a knife. Evidently these damaged trees suffered in total height growth.

NORTHERN WHITE PINE DISEASE CONTROL. Merle T. Hilborn, James D. Curtis. A total of 109 trees were examined in stands on the University Forest, 18 of which were cut down and examined in detail. The results of these examinations were largely negative. The most significant facts were: (a) All injuries to the trees recorded occurred between 24 and 30 years ago and most of them between 28 and 30 years ago. (b) Cankers were present on all sides of the trees. (c) While the majority of the trees examined were

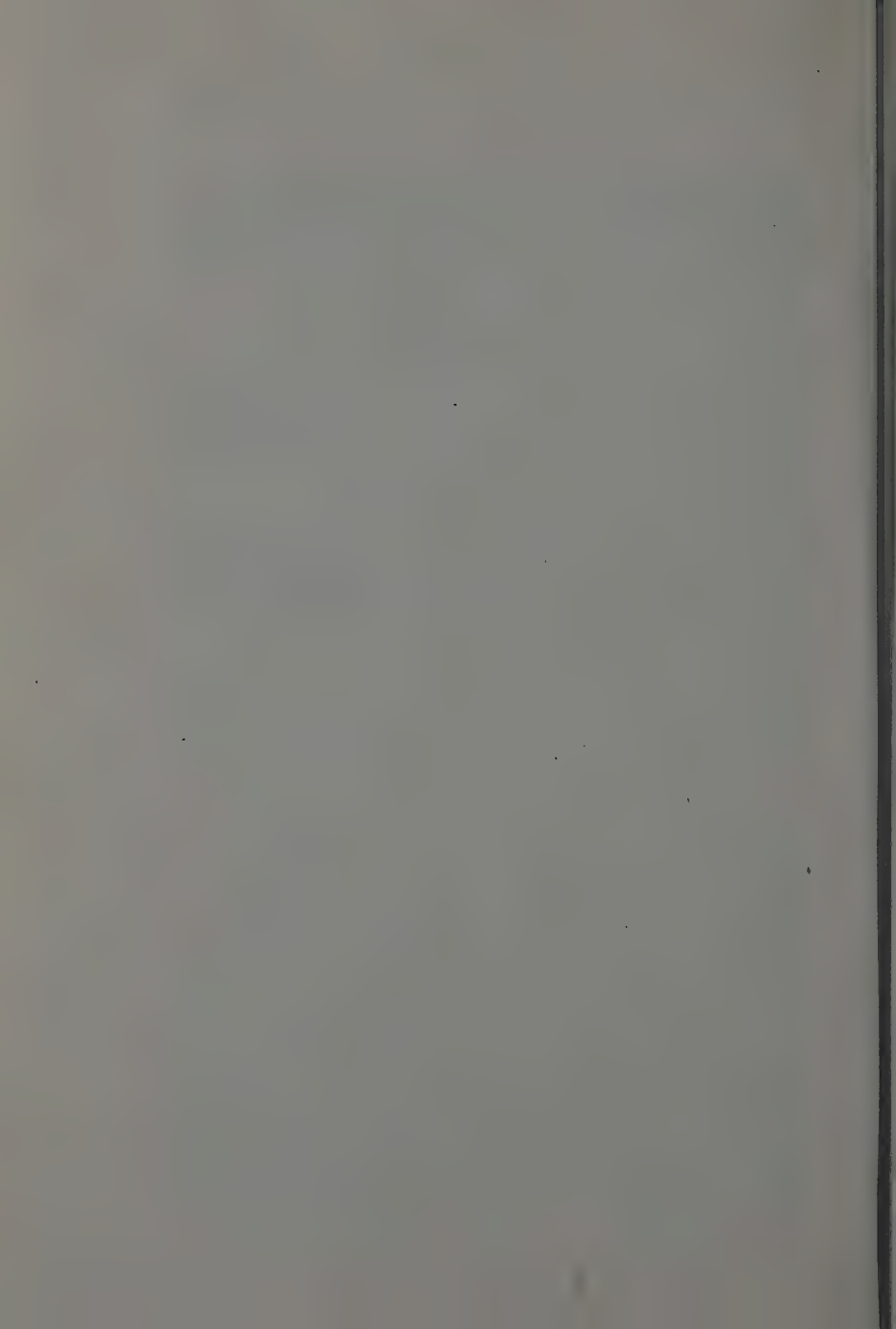
of the intermediate crown class, there were many codominants and 4 dominants affected. (d) The cankered areas were not commonly in an advanced state of decay. (e) The injury does not appear to be currently active and new occurrences were not found.

PUBLICATIONS

Further information on any of the research of the Station may be obtained by writing to the individuals in charge of the various studies. Publications of the Station will be sent free upon request.

MISCELLANEOUS PUBLICATIONS

Each county in the State has been surveyed from the standpoint of the Primary Wood Using Industries and a report prepared. These reports have been mimeographed and are available to anyone interested.



INSPECTION SERVICE

INSPECTION SERVICE. Elmer R. Tobey, C. Harry White, Bernie E. Plummer, Jr., Millard G. Moore, *Edward O. Merrill, *A. Stanley Getchell, *C. Byron Sibley, *John S. Getchell, Lloyd G. Keirstead, George P. Steinbauer, and Joanne M. Goodine. The Commissioner of Agriculture is the executive of the laws regulating the sale of fertilizers, agricultural seeds, insecticides, fungicides, foods, drugs, and feeding stuffs in Maine. It is the duty of the Director of the Maine Agricultural Experiment Station to analyze or cause to be analyzed the samples collected by the Commissioner and to publish the results of the analyses together with the names of the persons from whom the samples were obtained and such additional information as may seem advisable. This information is reported in the Official Inspections published during the year. The State Tax Assessor is the executive of the laws regulating the sale of gasoline and motor lubricants. It is the duty of the Director of the Station to analyze or cause to be analyzed the samples collected by the State Tax Assessor but no provision has been made for the publication of the results of the analyses.

In addition to the inspection service the department is requested frequently to make analyses of various types of materials for individuals. The amount of this work, which the laboratory is able to do, is limited by the amount of time that is available from the regulatory and research work. These unofficial samples include milk, cream, seeds, vinegar, miscellaneous substances, and materials suspected to contain poison. The results of the analyses on these samples are not published but are reported to the individuals who submit the samples.

A brief summary of the work of inspection is as follows :

Testing of Dairy Glassware. It is required by law that all Babcock glassware used in Maine by creameries, ice cream factories or others buying or selling milk or cream on a basis of the butterfat content must be tested for accuracy at the Maine Agricultural Experiment Station. One thousand one hundred two pieces have been examined. One piece was not passed.

Fertilizer Inspection. Two hundred four samples of fertilizer materials were collected and analyzed. One hundred fifty-five of

* On leave of absence, Military service.

these samples were mixed fertilizers containing nitrogen, phosphoric acid, potash, and in some of the samples, magnesium. The samples of mixed fertilizers represented one hundred fifteen different brands. Of the total number of samples received thirty were found to be below guaranty in total nitrogen, thirty-three in available phosphoric acid, fourteen in total phosphoric acid, thirty-one in water soluble potash, eight in water soluble magnesium, eight in total magnesium, and two in total calcium oxide. The results of the analyses are reported in Official Inspections 193.

Agricultural Seeds. Fungicides and Insecticides Inspection.

One hundred thirty-six official samples of seeds and forty-four official samples of fungicides and insecticides were collected and analyzed. The majority of the seed samples tested showed close agreement between the per cent of germination and the per cent purity as given on the label and as found in the laboratory. The greatest difference between the guaranties on the label and results obtained in the laboratory were relative to the noxious weed seed content. In several instances a large number of noxious weed seeds were found per pound of seed but were not reported on the label. Certain crop seeds such as corn, soybeans, and cereals seldom have many noxious weed seeds in them. Others are more likely to have impurities in them and should be examined more carefully when seed stocks are being purchased. The results of analyses on the samples of fungicides and insecticides showed six deficiencies in respect to guaranties. The results of the analyses are reported in Official Inspections 194.

Food and Drug Inspection. The number and variety of samples collected and submitted depend upon the nature of the inspection work carried on by the Division of Inspection, Augusta, Maine, in the enforcement of the food and drug laws. A total number of two thousand two hundred twelve samples, which consisted of samples of bologna, frankfurts, sausage, milk and cream, dietetic beverage, Hamburg steak, maple syrup, imitation olive oil, oil used in packing sardines, pickling compounds, vinegar, sardines, shellfish, dilute hydrochloric acid, spirit of camphor, spirit of peppermint, and miscellaneous samples, have been examined and the results of the analyses are reported in Official Inspections 195. From the results of these analyses, if the samples did not conform to the guaranties or to the standards fixed by law, recommendations that

hearings be appointed were made to the Chief of the Division of Inspection.

Bacteriological Work. In the bacteriological laboratory a total of two thousand one hundred six samples have been examined. This number includes one thousand six hundred ninety-eight samples of milk and cream, twenty-four samples of Hamburg steak, twenty-five samples of ice cream, five samples of mixtures of ice cream and sherbet, one hundred eighty-three samples of clams, sixty-three samples of mussels, eight samples of potato starch, and one hundred five miscellaneous samples. The miscellaneous samples have been examined for the United States Army, Municipal departments of health and private individuals. It was found by analysis that twelve of the official samples of milk were adulterated by the addition of water. The results of the analyses are reported in Official Inspections 195.

Feeding Stuffs Inspection. Five hundred fifteen samples of feeding stuffs were received and the percentages of protein, fat, and fiber in these samples were determined. Twenty-three samples were found to be below guaranty in protein, five of which showed a deficiency of five per cent or more of the protein guaranty. Ninety-eight samples were found to be below guaranty in fat and forty-nine samples exceeded the maximum guaranty in fiber. Although the manufacturers of commercial feeds have been handicapped by the shortage of ingredients and by labor problems, the results of the analyses show a marked improvement in conformity to guaranties as compared with the results of the previous year.

The three official samples of alfalfa meal were analyzed for carotene content by the official A.O.A.C. method as soon as received at the Experiment Station. Sample number 24793 was found to contain one hundred parts per million, sample number 24434 to contain seventy-nine parts per million, and sample number 24406 to contain one hundred seven parts per million. The samples of alfalfa meal were found to have a carotene content considerably higher than the results obtained on samples received last year.

Although alfalfa meals may have, even at the time of harvest, quite a variation in carotene content, good grades of Maine grown dehydrated alfalfa meals have been found to have a carotene content of two hundred to three hundred parts per million.

The results of the analyses of feeding stuffs are published in Official Inspections 196.

Gasoline Inspection. Fifty-four samples of gasoline were received. The results of the analyses indicated that all but one of these samples complied with the specification of the Maine law regulating the sale of motor gasoline, that the maximum temperature for complete distillation shall not exceed 437° F.

Motor Lubricants Inspection. Fifty-nine of the three hundred twenty-nine samples of motor oils, which were examined, failed to meet the manufacturers' specifications for the respective brands asked for by the inspector.

ANNOUNCEMENTS

Mrs. Beulah O. Wells, Assistant in Home Economics Research, resigned effective May 31, 1945.

Miss Celia Goos, Assistant in Home Economics Research, resigned effective June 30, 1945.

Mr. Alvah L. Perry, Assistant in Agricultural Economics, resigned effective May 31, 1945.

Mr. Roger M. Cobb was appointed as Assistant in Entomology, effective September 1, 1944.

Dr. Marion R. Harris was appointed as Assistant Plant Pathologist, effective September 1, 1944.

Prof. Dwight B. Demeritt, Head of our Forestry Department, was on leave from July 31, 1944 to September 14, 1945 for service with the War Production Board.

PUBLICATIONS

The Station is organized so that the work of investigation is distinct from the work of inspection. The results of investigation are published in the bulletins of the Station and in scientific journals, both foreign and domestic. The bulletins for the year, including this Report of Progress, make up the complete annual report. The results of the work of inspection are printed in publications known as Official Inspections. These are paged independently of the bulletins and may be bound with the annual reports as an appendix thereto. Miscellaneous publications, including newspaper notices of bulletins and newspaper articles which are not paged consecutively and for the most part are not included in the annual

report, also are issued during the year. A new practice was initiated in 1941-42 and has been followed again this year for the Report of Progress. The complete Report is being printed as usual, but for distribution within the State reprints have been prepared for various subject matter fields. Those desiring only the report on Potatoes, for instance, may obtain this by requesting Bulletin 438—Potatoes. The other reprints are as follows: Bulletin 438—Poultry; Bulletin 438—Foods and Nutrition; Bulletin 438—Dairying; Bulletin 438—Fruits; Bulletin 438—Canning, Field, and Garden Crops; Bulletin 438—Forestry.

BULLETINS ISSUED IN 1944-1945

- No. 427. Early Harvesting of Healthy Seed Potatoes for the Control of Potato Diseases in Maine.
- No. 428. Composition and Uses of Blueberries.
- No. 429. Use of Machinery and Horses on Maine Farms Keeping Dairy Cows.
- No. 430. A Four-Year Study of the Food Habits and Physical Condition of Grade-School Children in Newport, Maine.
- No. 431. The Mexican Bean Beetle in Maine.
- No. 432. Costs and Practices in Producing Potatoes in Southern Aroostook County, Maine, 1941.
- No. 433. Kerosene Burners in a Wood Cookstove.
- No. 434. Treatment of Potato Refuse Piles to Prevent Spread of Late Blight.
- No. 435. Maine Farm Prices During World War Periods.
- No. 436. Use of Labor on Maine Farms with Dairy Cows.
- No. 437. Size of Loads and Delivery Costs for Labor in Milk Distribution in Boston and Portland.
- No. 438. Report of Progress for the Year Ending June 30, 1945.
 - Reprints from Report of Progress, Bul. 438:
 - Poultry
 - Potatoes
 - Foods and Nutrition
 - Dairying
 - Fruits
 - Canning, Field, and Garden Crops
 - Forestry
- No. 393-S. Food-Plant Catalogue of the Aphids of the World Including the Phylloxeridae. Index to Genera and Species of Food Plants.

OFFICIAL INSPECTIONS ISSUED IN 1944-1945

- No. 192. Commercial Feeding Stuffs, 1943-1944.
- No. 193. Commercial Fertilizers, 1944.
- No. 194. Commercial Agricultural Seeds and Fungicides and Insecticides, 1944.
- No. 195. Foods and Drugs, 1944-1945.

MISCELLANEOUS PUBLICATIONS ISSUED IN 1944-1945

- No. 592. The Primary Wood Using Industries of Kennebec County for the Year 1942.
- No. 593. The Primary Wood Using Industries of Franklin County for the Year 1942.
- No. 594. The Primary Wood Using Industries of Androscoggin and Sagadahoc Counties.
- No. 595. The Primary Wood Using Industries of Cumberland County.
- No. 596. The Primary Wood Using Industries of York County.
- No. 597. Farm Labor on Maine Poultry Farms.
- No. 598. The Primary Wood Using Industries of Oxford County.
- No. 599. The Primary Wood Using Industries of Knox-Lincoln Counties.
- No. 600. Marketing of Hatching Eggs and Baby Chicks.
- No. 601. List of Available Publications.

METEOROLOGICAL OBSERVATIONS

The Station is indebted to the Department of Physics of the University for the meteorological summary for Orono for 1944 which appears on the following page.

The instruments used are located on the University campus at Lat. 44° 54' 2" N., Long. 68° 40' 5" W., Elevation 135 feet. They are the same as those used in preceding years and include: maximum and minimum thermometers, rain gauge, self-recording anemometer, vane, and barometers. The observations at Orono now form an almost unbroken record of seventy-six years.

METEOROLOGICAL SUMMARY FOR 1944
U. of M. Orono, Maine

1944	January	February	March	April	May	June	July	August	September	October	November	December	Average	Total
Highest temperature	45	49	61	73	92	98	98	104	81	79	70	55	—	—
Lowest temperature	-8	-13	-5	21	30	31	44	41	28	22	17	-13	—	—
Mean temperature	20.59	17.36	26.46	40.23	57.76	62.2	69.35	72.35	58.46	46.70	36.83	21.74	44.17	—
Mean temperature in 76 years	16.07	19.34	30.01	40.85	51.42	61.56	69.27	66.09	59.45	49.09	37.31	22.85	43.61	—
Total precipitation in inches	.67	2.94	2.62	2.13	.58	1.97	1.12	.89	6.39	4.38	4.09	2.32	—	30.10
Mean total precipitation in 76 years	3.78	3.89	3.45	2.78	3.13	3.44	3.26	3.07	3.49	3.97	3.47	3.39	—	41.12
Number of days with .01 inch precipitation or more	3	6	7	7	5	5	7	7	6	9	7	6	—	75
Snowfall in inches	5	18.5	2.5	—	—	—	—	—	—	1	3.5	16	—	46.50
Mean snowfall in 76 years	19.96	20.16	13.52	5.28	—	—	—	—	—	1.66	3.85	14.44	—	79.87
Number of clear days	13	8	10	9	14	21	19	21	13	7	8	17	—	151
Number of partly cloudy days	12	16	13	14	12	4	5	7	10	11	13	17	—	133
Number of cloudy days	5	6	8	7	5	5	7	3	7	13	9	7	—	82
Average wind velocity in miles per hour	4.65	4.12	4.80	4.09	4.72	4.20	4.41	4.13	4.58	4.61	4.59	4.76	4.52	—

METEOROLOGICAL SUMMARY

U. of M. Orono, Maine

January-June, 1945

1945	January	February	March	April	May	June
Highest temperature	48	48	81	89	76	92
Lowest temperature	-25	-11	6	21	28	30
Mean temperature	13.05	21.43	37.35	46.09	50.09	61.13
Mean temperature in 77 years	16.05	19.35	30.01	40.85	51.42	61.51
Total precipitation in inches	4.55	2.71	1.90	3.40	7.07	1.90
Mean total precipitation in 77 years	3.40	3.88	3.44	2.79	3.15	3.43
Number of days with .01 inch precipitation or more	11	7	9	10	13	14
Snowfall in inches	19	18	6.5	—	4	—
Mean snowfall in 77 years	19.93	20.14	13.51	5.27	1.06	—
Number of clear days	4	13	15	6	1	6
Number of partly cloudy days	16	8	7	11	8	11
Number of cloudy days	11	7	9	5	22	13
Average wind velocity in miles per hour	4.71	4.09	4.93	4.04	4.76	4.51

METEOROLOGICAL SUMMARY

Aroostook Farm, Presque Isle, Maine

January-June, 1945

1945	January	February	March	April	May	June
Highest temperature	50	40	65	80	74	89
Lowest temperature	-25	-13	-10	20	28	32
Mean temperature	10.9	16.5	31.6	45.5	49.6	60.2
Mean temperature in 19 years	12.0	13.7	24.4	37.7	51.2	60.4
Total precipitation in inches	2.98	1.06	1.22	3.86	4.76	3.14
Mean total precipitation in 19 years	1.99	1.42	2.23	2.32	2.92	3.81
Number of days with .01 inch precipitation or more	16	7	8	11	14	17
Snowfall in inches	23	10	3	0	6	0
Mean snowfall in 19 years	14.6	11.9	9.5	3.5	3	0
Number of clear days	8	11	10	11	9	5
Number of partly cloudy days	3	4	7	9	4	11
Number of cloudy days	20	13	14	10	18	14
Average wind velocity in miles per hour	—	—	—	—	—	—

MAINE AGRICULTURAL EXPERIMENT STATION

RAINFALL RECORDS, HIGHMOOR FARM, 1944

Readings taken daily at 7:00 a.m.

(Inches of precipitation during preceding 24 hours)

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	—	—	—	.61	Trace	.36
2	—	—	—	—	Trace	—
3	—	—	.56	—	.01	—
4	—	—	—	—	.02	—
5	—	—	—	—	.02	—
6	Trace	Trace	.17	—	1.00	—
7	—	—	—	.50	.18	—
8	—	—	—	.83	—	—
9	—	—	—	.41	.12	1.23
10	—	—	—	—	1.25	.04
11	.19	—	—	—	.21	—
12	.61	—	—	—	—	.15
13	.24	—	.75	—	—	.30
14	—	—	.03	.30	—	—
15	—	—	4.09	—	—	—
16	—	—	—	—	—	—
17	.04	—	—	—	Trace	—
18	—	.02	—	—	Trace	—
19	—	—	—	—	—	—
20	—	—	—	—	—	—
21	.12	—	—	.28	.02	—
22	.14	—	.15	.90	.10	Trace
23	—	—	—	—	.70	—
24	—	—	—	—	.58	—
25	—	.37	—	.53	.05	—
26	—	.87	—	—	—	.57
27	.15	.04	—	—	—	—
28	.02	—	.30	—	.28	.04
29	1.21	—	—	—	—	.02
30	.14	—	—	—	2.37	—
31	.01	—	—	—	—	—
Totals	2.87	1.30	6.05	4.36	6.91	2.73

MAINE AGRICULTURAL EXPERIMENT STATION

RAINFALL RECORDS, HIGHMOOR FARM, 1945

Readings taken daily at 7:00 a.m.

(Inches of precipitation during preceding 24 hours)

Day	Jan.	Feb.	Mar.	Apr.	May	June
1	*	—	—	.14	—	—
2	2.05	Trace	—	.07	—	—
3	—	—	—	.03	—	—
4	—	—	Trace	.02	.55	—
5	.02	—	Trace	1.00	.53	.12
6	—	.30	—	.67	—	.16
7	—	—	.28	—	—	Trace
8	.30	Trace	.19	—	—	Trace
9	—	.24	—	—	.27	.08
10	—	.07	—	—	—	.17
11	—	.12	—	—	1.10	.18
12	—	—	—	—	.27	.27
13	.08	—	—	—	.08	—
14	—	—	—	.04	.47	—
15	.27	—	—	—	.26	—
16	—	.27	.17	—	.22	1.06
17	—	.12	—	—	.01	.04
18	.70	—	—	.65	.30	Trace
19	—	—	—	—	1.09	1.04
20	—	—	—	—	Trace	.25
21	—	—	.32	—	—	1.42
22	—	.25	.41	.52	.05	.19
23	—	1.08	.30	—	—	—
24	.13	—	.01	—	.01	—
25	—	—	—	—	—	—
26	—	—	—	.40	—	.40
27	—	.45	—	.64	—	.69
28	—	—	Trace	.56	Trace	Trace
29	—	—	—	—	1.13	.02
30	.56	—	.03	—	—	—
31	—	—	—	—	.31	—
Totals	4.06	2.90	1.71	4.74	6.65	6.09

* Precipitation included in the record for the next day.

REPORT ON THE FINANCES OF THE STATION

The Station is a department of the University and its accounts are kept in the office of the Treasurer of the University. The books, voucher files, etc., are, however, all distinct from those of the other departments of the University. The classification of accounts is that prescribed by the auditors on the part of the Federal Government, and approved by the State Auditor. All of the accounts may be audited by the State Auditor, and the Hatch Fund, Adams Fund, Purnell Fund, and Bankhead-Jones Fund accounts are also audited by the Office of Experiment Stations acting for the Secretary of Agriculture of the United States in accordance with federal law.

The cost of maintaining the laboratories for the inspection analyses is borne by analysis fees and by the State Department of Agriculture. The income from sales at the experimental farms and the poultry plant is used for the expense of investigations.

At Aroostook Farm there are, in connection with the cooperative work with the Federal Department of Agriculture, certain expenditures for the Department made from sales of crops from Department investigations. These expenditures are carried as distinct and separate accounts, always with credit balances on the Station ledger.

MAINE AGRICULTURAL EXPERIMENT Income and Expenditures 19

	FEDERAL FUNDS				MILL TAX				
	Hatch	Adams	Purnell	Bankhead-Jones	Total	Bankhead-Jones Offset	Maintenance	Total	Inspect Analg
Income	15,000.00	15,000.00	60,000.00	20,692.16	110,692.16	20,692.16	25,091.17	45,783.33	17,255.
Expenditures									
Personal Services.....	10,519.54	14,191.99	47,731.04	16,700.28	89,142.85	18,163.64	12,425.69	30,589.33	15,384.
Supplies and Materials...	984.25	508.99	7,621.65	1,303.47	10,418.36	1,206.82	3,212.10	4,418.92	693.
Transportation of Things...	79.32	1.20	17.56	.50	98.58	21.77	172.45	194.22	62.
Communication Service....	504.58	.10	200.88	14.67	720.23	4.70	472.55	477.25	157.
Heat, Light, Power, etc....	644.23				644.23		539.88	539.88	494.
Rent of Bldg. Space or Equipment	32.60	—	195.60	130.40	358.60	32.60	624.95	657.55	—
Rent of Land	—	—	700.00		700.00		—	—	10.
Printing and Binding	590.33	—	1,071.34	114.69	1,776.36	225.35	4,027.47	4,252.82	150.
Travel	916.15	153.80	1,505.58	1,434.47	4,010.00	678.17	1,873.91	2,552.08	102.
Repairs and Alterations...	209.70	103.38	573.00	30.65	916.73	150.85	780.65	931.50	200.
Equipment	519.30	40.54	383.35	963.03	1,906.22	208.26	1,444.37	1,652.63	—
Buildings and Land	—	—	—	—	—	—	—	—	—
Total	15,000.00	15,000.00	60,000.00	20,692.16	110,692.16	20,692.16	25,574.02	46,266.18	17,255.
Net Excess of Income or (Expenditures).....	—	—	—	—	—	—	(482.85)	(482.85)	—

ENT STATION 144-1945

STATE DEPARTMENTS			SALES and SERVICES				
Hon sis	Potato Tax	Total	Arrostook Farm	Highmoor Farm	Soil Erosion	General	Combined Total
39	34,000.01	51,255.40	7,061.50	23,313.25	5,377.85	6,175.04	249,658.53
15	24,497.41	39,881.56	8,594.38	13,006.89	743.46	—	181,957.47
53	4,011.22	4,704.75	3,069.62	7,643.74	58.33	—	30,313.72
58	228.81	291.39	13.13	318.24	2.53	—	978.05
52	194.10	351.62	122.27	100.72	2.45	—	1,774.76
12	987.28	1,481.40	262.51	744.72	—	—	3,672.74
	494.00	494.00	916.00	24.70	380.00	—	2,830.85
55	177.39	187.94	300.00	—	—	—	1,000.00
49	2,050.83	2,201.32	13.33	54.45	—	—	6,230.45
11	235.72	337.83	30.76	1,090.06	100.08	—	8,848.61
34	1,123.25	1,323.59	659.45	880.30	—	—	4,035.65
	—	—	112.80	89.18	—	—	6,386.61
39	34,000.01	51,255.40	14,778.12	23,953.21	1,285.82	—	248,230.89
	—	—	(7,716.62)	(639.96)	4,092.03	6,175.04	1,427.64
							1,910.49
							40,017.15
							248,230.89

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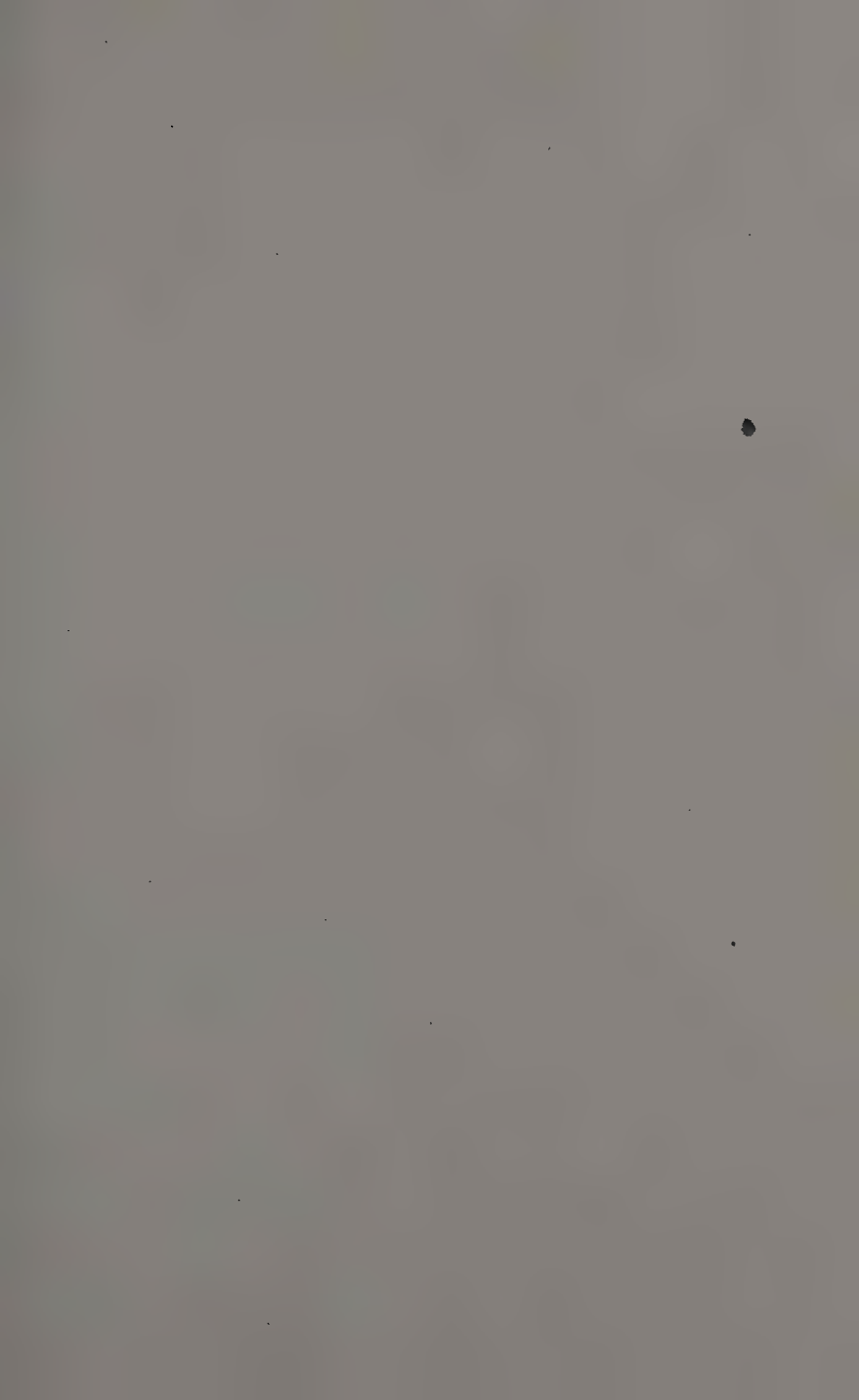
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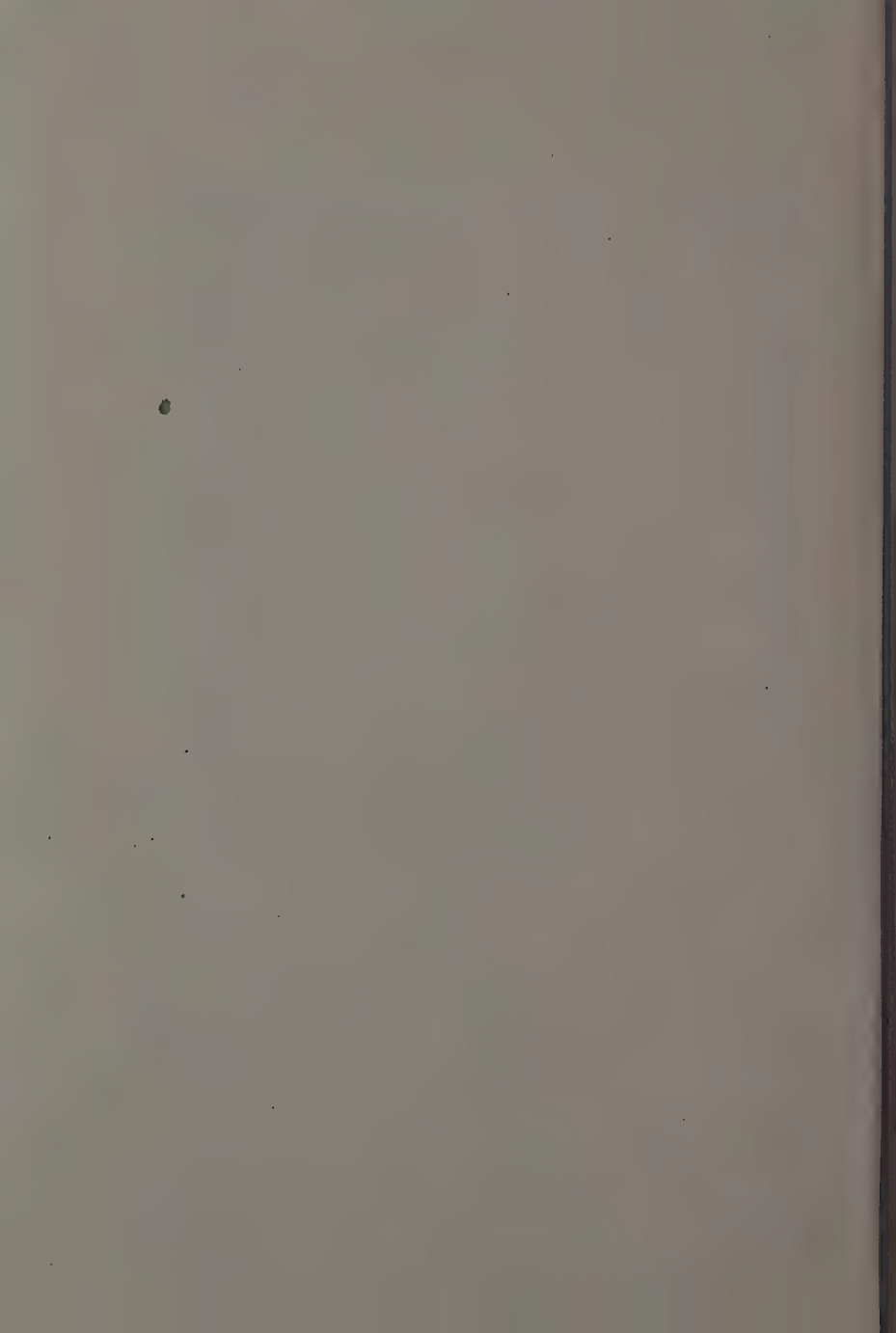
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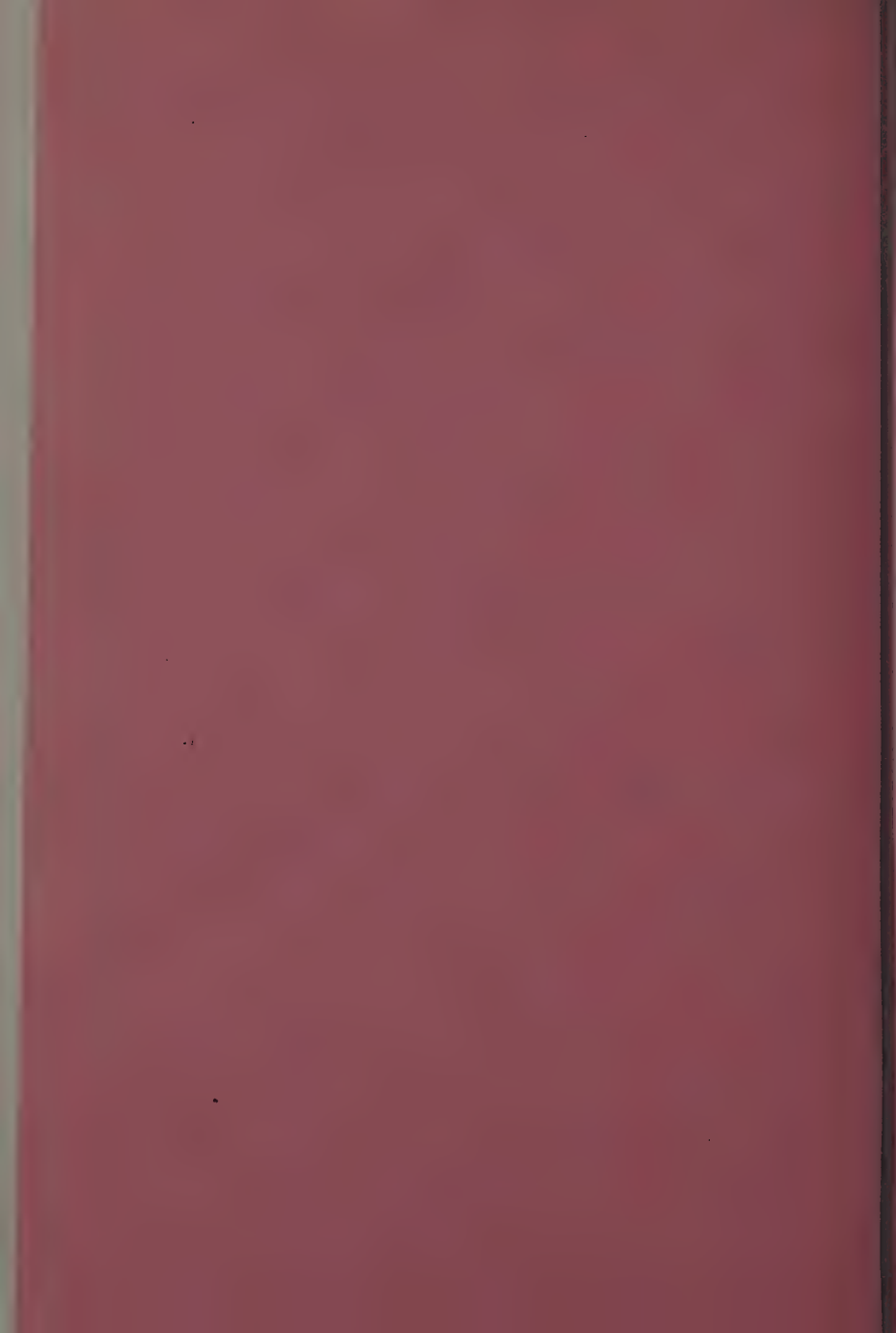
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July, 1944

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AGRICULTURAL EXPERIMENT STATION
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Official Inspections

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COMMERCIAL FEEDING STUFFS, 1943-44

ELMER R. TOBEY

The Commissioner of Agriculture is the executive of the law regulating the sale of feeding stuffs in Maine. It is the duty of the Director of the Maine Agricultural Experiment Station to make, or to cause to have made, the analyses of the samples collected by the Commissioner and to publish the results of the analyses and such additional information as may seem advisable.

NOTE: All correspondence relative to the inspection laws should be addressed to the Division of Inspection, Department of Agriculture, Augusta, Maine.

* On leave of absence. Military service.

FEEDING STUFFS INSPECTION

In this bulletin are given the results of the analyses of feeding stuffs collected by the inspectors from July 1, 1943 to July 1, 1944. It is required by law that the samples be taken by the Commissioner of Agriculture or his agents, that the analyses be made and the results published by the Maine Agricultural Experiment Station. Credit for the analyses is due to C. Harry White and Bernie E. Plummer, Jr., Associate Chemists, and Lloyd G. Keirstead, Assistant in Chemistry; for the compilation of the results of analyses to Rose H. McGuigan, Stenographer.

The Maine Feeding Stuffs Law requires that every lot or package offered or exposed for sale, distribution or transportation shall be plainly marked with a statement of the minimum percentage of crude protein, the minimum percentage of crude fat, and the maximum percentage of crude fiber.

The term crude protein is used to designate a large group of complex compounds which contain nitrogen and is obtained by multiplying the percentage of total nitrogen in the feed by the factor 6.25.

The term crude fat is used to designate the material which can be extracted from the moisture-free feed with ether.

The term crude fiber is used to designate the woody tissues which are present in the outer coats of cereal and other fodder grains. It is mostly cellulose.

Three hundred eighteen samples of feeding stuffs were collected and analyzed. The percentages of protein, fat, and fiber were determined on all samples of cereal and vegetable feeds, and the percentages of protein and fat on all samples of animal products.

Due to wartime conditions the manufacturers of commercial feeds have been forced at times to make quick substitutions for ingredients in their finished products. The supply of high protein ingredients and the oil meals has been curtailed considerably. Next to labor problems the shortage of ingredients or raw materials has been the largest problem of the manufacturers. It is interesting to note how these conditions have affected the commercial feeds sold in Maine as reflected in the results of analyses of the official samples submitted to the Station by the Division of Inspection, Augusta, Maine. Although the deficiencies in protein, as compared to the guaranties, are greater in amounts of protein this year as compared

to last year the relative number of samples, which were deficient, is slightly less. The guaranties in fiber have been met as well as in the previous year. The relative number of samples below guaranty in fat is somewhat greater than last year.

The following samples were found to have a deficiency in protein of five per cent or more of the protein guaranty.

Alfalfa Meal.—Saunders Mills, Inc., Toledo, O., No. 24092, Alfalfa Meal 20% Vita-Green; No. 24036, Vita-Greens Alfalfa Meal.

Dairy and Stock Feeds.—Blatchford Cali Meal Co., Waukegan, Ill., No. 24037, V-D; W. B. Deering Lumber Co., Hollis Center, Me., No. 24061, Hollis Union Dairy Ration; New England Grain Co., Portland, Me., No. 24030, New England 18% Test Ration; Paris Farmers Union, South Paris, Me., No. 24232, Paris Farmers Union Hog Ration; Sawyer Grain Co., Lewiston, Me., No. 24169, Sawyer Pig and Hog Ration; Webber Grain & Feed Co., Westbrook, Me., No. 24072, Clover Bee Hog Ration Complete.

Poultry Feeds.—Delaware Mills, Inc., Deposit, N. Y., No. 24049, Delaware Laying Mash; No. 24053, Delaware Turkey Growing Mash; Morrill's Coal & Grain Co., Portland, Me., No. 24116, Garsoe Bros. Laying Mash; New England Grain Co., Portland, Me., No. 24031, New England Egg Mash; Paris Flouring Co., Portland, Me., No. 24062, New England Conference Laying Mash with Cod Liver Oil; J. M. Tanguay, Inc., Greene, Me., No. 24183, Our Own New England Conference Laying Mash; Webber Grain & Feed Co., Westbrook, Me., No. 24074, Clover Bee Laying Mash.

The following index table includes a summary of the number of samples, varieties of feeds collected and examined, the number found to be below guaranty in protein and in fat, the number found to be above guaranty in fiber, and the pages on which the results of the analyses are recorded.

Variety of Feed	Number examined	Number below guaranty in		Number above guaranty in	Analyses on page
		Protein	Fat	Fiber	
Alfalfa meals.....	2	2	1	2	5
Animal products.....	6	0	1	0	5
Brewers and distillers dried grains.....	2	1	1	1	5
Corn by-products—					
Gluten feeds and meals	4	0	0	1	5
Hominy feeds.....	2	0	0	1	6
Corn and oat feeds....	7	0	3	3	6
Oil seed meals—					
Cottonseed meals...	1	1	0	0	6
Linseed meals.....	3	0	0	0	6
Soybean meals.....	3	0	0	0	7
Proprietary feeds—					
Dairy and stock feeds.....	117	9	36	9	7
Poultry feeds.....	126	9	26	11	12
Wheat products—					
Bran.....	17	0	0	2	17
Feed flours.....	2	0	0	0	18
Middlings and shorts	12	1	1	3	18
Mixed feeds.....	9	0	2	1	19
Miscellaneous feeds..	5	0	2	1	19
Totals.....	318	23	73	35	

Alfalfa meal and alfalfa leaf meal have long been used in poultry rations and in rations for other farm animals primarily for the vitamin content. As the commercial alfalfa products, offered for sale in Maine, have usually been in transportation and storage for considerable time before being purchased by the consumer, the vitamin content has frequently become much depleted.

The two official samples of alfalfa meal were analyzed for carotene content by the official A. O. A. C. method as soon as received at the Experiment Station. Sample number 24092 was found to contain thirty parts per million and sample number 24036 to contain two parts per million. Although alfalfa meals may have, even at the time of harvest, quite a variation in carotene content, good grades of Maine-grown, dehydrated alfalfa meals have been found to have a carotene content of two hundred to three hundred parts per million.

Analyses of Samples of Feeding Stuffs

Station number	Name and Address of Manufacturer or Wholesaler and Name of Goods	Where taken	Protein	Fiber	Fat
	ALFALFA MEALS		%	%	%
24092	Saunders Mills, Inc., Toledo, O. Alfalfa Meal 20% Vita-Green	Saco	G* 20.00 F* 16.57	20.00 30.20	1.50 2.57
24036	Vita-Greens Alfalfa Meal	Portland	G 15.00 F 11.19	32.00 40.66	1.50 0.95
	ANIMAL PRODUCTS				
	Consolidated Rendering Co., Boston, Mass.				
24137	Corenco Bone Meal	Portland	G 20.00 F 24.94	0.00	2.00 0.97
24041	Corenco Fish Meal	Portland	G 53.00 F 61.51	0.00	5.00 10.33
24136	Corenco 45% Meat and Bone Scraps	Portland	G 45.00 F 45.44	0.00	6.00 8.43
24045	Maine Fish Meal Co., Portland, Me. Maine Vitamin D Concentrate	Portland	G 50.00 F 50.94	1.00	10.00 19.84
	John Reardon & Sons, Cambridge, Mass.				
24043	50% Register Brand Meat and Bone Scraps	Portland	G 50.00 F 50.07	0.00	8.00 11.34
	Ward Milk Products Division, Chicago, Ill.				
24271	Ward's Dried Skim Milk (Feeding)	Belfast	G 32.00 F 32.13		0.50 0.60
	BREWERS AND DISTILLERS DRIED GRAINS				
	Narragansett Brewing Co., Cranston, R. I.				
24091	Dried Brewers Grain	Saco	G 25.00 F 24.06	18.00 17.16	5.00 5.92
	National Distillers Products Corp., New York, N. Y.				
24090	Produlac Brand Dried Distillers Grains with Solubles	Portland	G 27.00 F 30.69	9.00 9.20	8.00 6.03
	CORN BY-PRODUCTS				
	Gluten Feeds and Meals				
	American Malze Products Co., New York, N. Y.				
24302	Amalzo Gluten Meal	Hampden	G 41.00 F 44.88	6.00 5.05	1.00 2.74
24093	Cream of Corn Gluten Feed Amalzo	Saco	G 23.00 F 25.31	9.50 8.55	2.00 2.54
	Corn Products Refining Co., New York, N. Y.				
24042	Buffalo Corn Gluten Feed	Portland	G 23.00 F 26.69	8.00 8.16	2.00 2.74
24040	A. E. Staley Mfg. Co., Decatur, Ill. Staley's Corn Gluten Feed	Portland	G 25.00 F 28.76	8.00 6.99	1.50 3.41

* These letters indicate guaranteed and found, respectively.

FEEDING STUFFS—Continued

Station number	Name and Address of Manufacturer or Wholesaler and Name of Goods	Where taken	Protein		
			Fiber	Fat	
			%	%	%
	Hominy Feeds				
24099	Kellogg Co., Battle Creek, Mich. Kellogg Hominy Feed	Biddeford	G* 10.00 F* 10.88	5.00 3.78	6.00 6.03
24088	Miner-Hillard Milling Co., Wilkes-Barre, Pa. Steam Cooked Hominy Feed	Saco	G 10.00 F 11.88	5.00 5.44	5.00 7.89
	CORN AND OAT FEEDS				
24312	J. H. Farwell & Son, Unity, Me. Ground Corn and Oats	Unity	G 9.00 F 12.44	7.00 8.78	4.00 4.65
24342	Flory Milling Co., Bangor, Pa. Flory Corn and Wheat, and Oats	North Edgecomb	G 9.00 F 13.00	4.00 3.98	2.50 2.66
24185	D. H. Maxim Estate, Winthrop, Me. Maxim's Corn and Oat Feed	Winthrop	G 9.00 F 11.38	9.00 5.90	4.00 5.43
24207	Merrill & Mayo, Inc., Waterville, Me. Corn and Oat Chop	Waterville	G 10.00 F 11.25	6.00 6.03	5.00 3.90
24238	Norway Farmers Union, Norway, Me. Ground Corn and Oats	Norway	G 10.00 F 10.88	7.00 5.07	4.00 4.00
24270	Walter H. Ray, Anson, Me. Ground Corn and Oats	Anson	G 10.00 F 14.22	5.00 5.39	4.00 3.01
24155	Charles E. Thurston & Sons, Danville, Me. Corn and Oat Chop	Danville	G 10.00 F 11.75	10.00 6.91	4.00 3.37
	OIL SEED MEALS				
	Cottonseed Meals				
24044	Ashcraft-Wilkinson Co., Atlanta, Ga. Cow-Eta Brand 41% Cottonseed Meal Prime Quality	Portland	G 41.00 F 40.44	13.00 10.59	5.00 5.97
	Linseed Meals				
24063	Archer-Daniels-Midland Co., Minneapolis, Minn. Archer-Daniels 34% Old Process Linseed Oil Meal	Buxton	G 34.00 F 35.70	9.00 7.81	3.50 6.12
24301	National Lead Co., New York, N. Y. Dutch Boy Old Process Linseed Oil Meal 34%	Hampden	G 34.00 F 38.88	10.00 8.19	4.50 5.73
24047	Spencer Kellogg & Sons, Inc., Buffalo, N. Y. Kellogg's 34% Old Process Linseed Oil Meal	Portland	G 34.00 F 34.51	9.00 8.63	3.50 6.18

* These letters indicate guaranteed and found, respectively.

FEEDING STUFFS—Continued

Station number	Name and Address of Manufacturer or Wholesaler and Name of Goods	Where taken	Protein	Fiber	Fat
	Soybean Meals		%	%	%
24135	Drackett Products Co., Cincinnati, O. Drackett Soybean Oil Meal 44%	Portland	G* 44.00 F* 45.13	7.00 5.25	0.50 4.83
24089	Oswego Soy Products Corp., Oswego, N. Y. Old Process Expeller 41% Soy Bean Oil Meal	Saco	G 41.00 F 43.63	7.00 5.77	4.50 5.27
24225	The Southern Cotton Oil Co., Selma, N. C. Sco-Co Brand Soybean Oil Meal	Norway	G 45.00 F 45.57	7.00 5.80	4.50 6.61
	PROPRIETARY FEEDS				
	Dairy and Stock Feeds				
24303	Bangor Farmers' Union Co., Bangor, Me. Bangor Dairy Ration 16%	Bangor	G 16.00 F 22.00	9.00 8.15	3.50 3.71
24276	Beacon Milling Co., Cayuga, N. Y. Auburn Dairy Ration	Belfast	G 16.00 F 17.44	10.00 7.72	3.25 3.87
24081	Beacon Calf Grains	Westbrook	G 14.00 F 16.50	10.00 6.80	4.00 3.23
24290	Beacon Calf Starter	Ellsworth	G 19.00 F 18.25	7.00 6.31	3.50 4.40
24278	Beacon Cayuga Horse Feed	Belfast	G 10.00 F 13.25	9.00 8.14	2.50 3.77
24277	Beacon Emergency Test Cow Ration		G 16.00 F 18.75	9.00 8.22	4.00 4.48
24230	Beacon Fitting Ration	Norway	G 14.00 F 15.69	8.00 7.49	3.75 3.39
24227	Beacon Goat Ration	Norway	G 16.00 F 16.75	10.00 7.09	3.50 3.60
24289	Beacon Hog Feed	Ellsworth	G 18.00 F 21.13	7.00 6.14	4.00 3.78
24292	Beacon Special 18	Ellsworth	G 18.00 F 18.88	9.00 7.64	3.50 3.57
24229	Beacon Test Cow Ration 16%	Norway	G 16.00 F 19.44	9.00 8.24	4.00 4.99
24291	Be-Co-Lass	Ellsworth	G 11.00 F 13.56	10.00 14.35	1.00 3.52
24324	Berry Bros., Morrill, Me. Berry Bros. Dairy Ration	Morrill	G 20.00 F 21.69	10.00 8.66	4.00 4.12
24325	Berry Bros. Fitting Ration	Morrill	G 14.00 F 19.79	10.00 8.11	3.00 4.21
24037	Blatchford Calf Meal Co., Waukegan, Ill. V-D	Portland	G 31.00 F 28.63	5.50 5.58	4.00 4.07
24124	Chas. M. Cox Co., Boston, Mass. Du-Ration Stock Feed	Portland	G 10.00 F 10.75	9.50 8.20	2.00 2.73
24126	Wirthmore Pig and Hog Feed	Portland	G 17.00 F 18.19	9.00 6.25	4.00 3.76
24131	Wirthmore Standard 18% Dairy Ration	Portland	G 18.00 F 18.50	8.50 6.53	3.00 3.83

* These letters indicate guaranteed and found, respectively.

FEEDING STUFFS—Continued

Station number	Name and Address of Manufacturer or Wholesaler and Name of Goods	Where taken	Protein	Fiber	Fat
			%	%	%
Dairy and Stock Feeds—Continued					
24328	Wirthmore Stock Feed	Morrill	G* 10.00 F* 13.25	9.50 8.75	2.00 3.17
24130	Wirthmore 14% Fitting Ration	Portland	G 14.00 F 15.13	8.00 6.57	4.00 3.92
24085	Wirthmore 16% Record Ration	Saco	G 16.00 F 16.50	8.00 6.72	4.00 4.08
24327	Wirthmore 18% Dairy Ration	Morrill	G 18.00 F 19.31	8.50 7.76	3.00 3.73
	C. B. Cummings & Sons Co., Norway, Me.				
24215	Cummings Pig and Hog Ration	Norway	G 10.00 F 14.50	7.00 3.08	3.00 3.14
	Dailey Mills, Inc., Binghamton, N. Y.				
24281	Dailey's 30% Dairy Supplement	Stockton Springs	G 30.00 F 32.26	10.00 10.48	4.53 5.29
	W. B. Deering Lumber Co., Hollis Center, Me.				
24061	Hollis Union Dairy Ration	Hollis Center	G 18.00 F 13.53	10.00 6.20	4.00 3.20
	Delaware Mills, Inc., Deposit, N. Y.				
24051	Delaware Fitting Ration	South Portland	G 14.00 F 15.25	10.00 5.08	4.00 3.05
24050	Delaware Horse Feed	South Portland	G 9.00 F 11.53	10.00 8.41	3.00 4.55
24054	Delaware Pig and Hog Feed	South Portland	G 16.00 F 16.38	8.00 5.05	4.00 3.03
24200	Delaware Stock Feed	Rockland	G 14.00 F 18.75	10.00 7.58	4.00 3.70
24055	Delaware Sweet 18% Dairy Feed	South Portland	G 18.00 F 18.50	10.00 6.86	4.00 3.60
	Dietrich & Gambrill, Inc., Frederick, Md.				
24252	All Purpose Complete Ration	Norridgewock	G 15.00 F 18.63	7.00 7.61	4.00 4.46
24251	Frederick 16% Dairy	Norridgewock	G 16.00 F 19.88	12.00 10.35	3.50 4.13
24253	Frederick 18% Dairy	Norridgewock	G 18.00 F 19.69	12.00 8.23	3.50 4.55
	Eastern States Farmers' Exchange, West Springfield, Mass.				
24163	Eastern States Fitting Ration 14%	Auburn	G 14.00 F 15.81	9.00 6.36	2.50 3.41
24167	Eastern States Horse Feed	Auburn	G 10.50 F 12.69	7.00 6.81	3.50 3.88
24157	Eastern States Sixteen	Auburn	G 16.00 F 19.09	8.50 6.09	3.50 3.82
24164	Stock Feed	Auburn	G 11.50 F 13.00	7.50 5.19	2.00 3.14
	Elmore Milling Co., Inc., Oneonta, N. Y.				
24205	Elmore Hog Ration	Camden	G 15.00 F 17.75	6.00 4.77	5.00 3.91
24242	Elmore Make Grow Little Pig Ration	Oxford	G 18.00 F 18.63	7.00 4.86	4.50 3.87
24086	Elmore Milk Grain 16%	Saco	G 16.00 F 20.88	10.00 7.51	5.00 5.69
24240	Elmore Milk Grain 16%	Oxford	F 17.94	7.79	5.00
	John W. Eshelman & Sons, Lancaster, Pa.				
24206	Eshelman Pennsy 16% Dairy Feed	Augusta	G 16.00 F 19.00	11.00 9.68	3.00 4.90

* These letters indicate guaranteed and found, respectively.

FEEDING STUFFS—Continued

Station number	Name and Address of Manufacturer or Wholesaler and Name of Goods	Where taken	Protein	Fiber	Fat
			%	%	%
	Dairy and Stock Feeds—Continued				
24208	Eshelman Red Rose 18% Dairy Feed	Augusta	G* 18.00 F* 20.31	9.00 7.95	4.75 4.20
24207	Eshelman Red Rose 85 Horse Feed	Augusta	G 9.00 F 12.44	10.00 9.92	3.30 4.13
24315	Flory Milling Co., Bangor, Pa. Flory 18% Test Ration	Unity	G 18.00 F 18.75	10.00 7.37	4.00 3.78
24323	Flory Horse Feed 85 Grains	Thorndike	G 9.00 F 10.31	10.03 8.85	2.50 3.70
24316	Flory Pig and Hog Meal	Unity	G 18.00 F 17.31	8.00 4.68	3.50 3.57
24317	Flory Stock Feed	Unity	G 9.50 F 16.94	12.00 10.23	2.50 3.58
24294	General Mills, Inc., Detroit, Mich. Larro Calf Builder	Hampden	G 24.00 F 24.81	5.50 5.58	4.00 6.18
24097	Larro 18% Dairy Feed	Biddeford	G 18.00 F 19.19	12.00 7.86	3.00 3.93
24295	Larro Sow and Pig Builder	Hampden	G 16.00 F 17.19	8.00 5.82	3.00 4.21
24280	A. W. Gilpatrick, Searsport, Me. Gilpatrick Fitting Ration	Searsport	G 14.00 F 22.25	8.00 9.13	5.00 5.05
	D. H. Grandin Milling Co., Jamestown, N. Y.				
24141	Grandin's Emergency Stock Feed	Portland	G 12.00 F 13.56	12.00 7.95	3.00 2.78
24140	Grandin's Pig and Hog Ration	Portland	G 18.00 F 19.19	10.00 4.11	4.00 3.35
24322	Grandin's 14% Fitting Ration	Unity	G 14.00 F 15.94	9.00 7.63	4.00 3.71
24320	Grandin's 16% Milk Maker	Unity	G 16.00 F 16.50	10.00 7.42	4.00 3.13
24341	Grandin's 16% Milk Maker	Damariscotta Mills	F 18.75	7.00	3.20
24321	Grandin's 18% Milk Maker	Unity	G 18.00 F 19.44	10.00 8.29	4.00 3.83
24340	Grandin's 18% Milk Maker	Damariscotta Mills	F 19.69	7.12	3.43
24142	Grandin's 18% Special Dairy Feed	Portland	G 18.00 F 20.19	10.00 9.06	3.50 4.13
24073	Hales & Hunter Co., Chicago, Ill. Pioneer 18% Dairy Feed	Westbrook	G 18.00 F 22.25	9.00 6.31	3.00 3.06
24078	Pioneer Pig and Hog Feed	Westbrook	G 20.00 F 22.00	7.50 6.71	4.00 4.45
24191	Kasco Mills, Inc., Waverly, N. Y. Beatsall Milk Grains	Coopers Mills	G 16.00 F 16.75	10.00 8.40	3.50 5.03
24187	Kasco Body Builder	Coopers Mills	G 15.00 F 16.50	7.00 5.97	3.00 4.37
24189	Kasco 18% Milk Maker	Coopers Mills	G 18.00 F 18.06	10.00 8.67	3.50 4.75
24188	Kasco Fitting Ration	Coopers Mills	G 14.00 F 14.94	8.00 5.53	3.50 4.70
	Maritime Milling Co., Inc., Buffalo, N. Y.				
24218	B. B. Bull Brand Dry and Fresh Cow Fitting Ration	Norway	G 13.00 F 19.50	9.00 8.06	3.50 3.69

* These letters indicate guaranteed and found, respectively.

FEEDING STUFFS—Continued

Station number	Name and Address of Manufacturer or Wholesaler and Name of Goods	Where taken	Protein	Fiber	Fat
	Dairy and Stock Feeds—Continued		%	%	%
24219	B. B. Calf Starter Ration	Norway	G* 18.50 F* 21.81	8.00 5.58	3.00 3.29
24221	Marmico 16% Dairy Feed (with Molasses)	Norway	G 16.00 F 19.19	12.00 7.76	3.00 3.85
24217	Sweetened B. B. Bull Brand 18% Dairy Ration	Norway	G 18.00 F 19.56	9.00 7.51	3.50 3.74
24186	D. H. Maxim Estate, Winthrop, Me. Maxim's Cow Feed	Winthrop	G 20.00 F 22.25	12.00 7.11	4.00 5.20
24119	Morrill's Coal & Grain Co., Portland, Me. Garsoe Bros. 14% Fitting Ration	Portland	G 14.00 F 16.50	9.00 8.04	4.00 4.01
24118	Garsoe Bros. 18% Dairy Ration	Portland	G 18.00 F 19.69	9.00 7.84	4.00 3.79
24030	New England Grain Co., Portland, Me. New England 18% Test Ration	Portland	G 18.00 F 16.75	9.00 8.63	4.00 3.67
24027	New England Fitting Ration	Portland	G 14.00 F 16.38	8.00 7.57	4.50 4.08
24029	New England Pig and Hog Ration	Portland	G 15.00 F 15.13	10.00 5.63	5.00 4.09
24035	Sterling 16% Dairy Feed	Portland	G 16.00 F 16.07	11.00 8.22	3.50 4.05
24232	Paris Farmers Union, South Paris, Me. Paris Farmers Union Hog Ration	South Paris	G 17.00 F 13.47	10.00 3.96	4.00 3.80
24337	Park & Pollard Co., Buffalo, N. Y. Doublex 18% Dairy Ration	Waldoboro	G 18.00 F 19.69	11.00 8.51	3.50 3.92
24107	Go-To-It Pig and Hog Ration	Biddeford	G 15.00 F 17.75	8.00 7.57	3.00 3.94
24266	Milkade Calf Meal	Waterville	G 20.00 F 25.63	7.00 4.76	3.50 4.15
24265	Milkade Calf Starter (Pelleted)	Waterville	G 22.00 F 24.19	5.00 6.02	4.00 4.99
24111	Milkmaid 16% Dairy Ration	Biddeford	G 16.00 F 18.63	10.00 8.96	3.50 3.97
24336	Milkmaid 18% Dairy Ration	Waldoboro	G 18.00 F 19.56	10.00 7.35	3.50 3.17
24264	Milkmaid Test Cow Ration	Waterville	G 18.00 F 22.25	9.00 9.46	4.00 4.31
24263	Park & Pollard Fitting Ration	Waterville	G 12.00 F 14.63	8.00 7.37	3.00 3.05
24335	Park & Pollard Stock Feed	Waldoboro	G 9.00 F 15.63	12.00 9.23	2.00 3.35
24114	Yankee Horse Feed	Biddeford	G 10.00 F 12.44	9.00 6.44	3.00 3.31
24071	Quaker Oats Co., Chicago, Ill. Quaker Green Cross Horse Feed	South Windham	G 10.00 F 13.69	12.00 9.22	2.50 4.06
24145	Ralston Purina Co., St. Louis, Mo. Purina B & M Cow Chow	Portland	G 16.00 F 18.19	10.00 8.52	3.50 4.79
24151	Purina Calf Startena	Portland	G 19.50 F 21.31	9.50 7.78	2.50 4.13
24148	Purina Dry and Freshening Chow	Portland	G 12.00 F 14.06	14.00 9.14	2.00 3.95

* These letters indicate guaranteed and found, respectively.

FEEDING STUFFS—Continued

Station number	Name and Address of Manufacturer or Wholesaler and Name of Goods	Where taken	Protein	Fiber	Fat
	Dairy and Stock Feeds—Concluded		%	%	%
24273	Purina 18% Cow Chow	Belfast	G* 18.00 F* 20.44	12.00 8.55	3.00 3.77
24146	Purina Omolene	Portland	G 10.00 F 12.31	11.00 7.76	3.30 4.07
24171	Sawyer Grain Co., Lewiston, Me. Sawyer Fitting Ration	Lewiston	G 12.00 F 14.94	9.00 5.83	3.50 2.81
24169	Sawyer Pig and Hog Ration	Lewiston	G 15.00 F 13.47	6.00 3.49	4.00 2.89
24168	Sawyer 16% Dairy Ration	Lewiston	G 16.00 F 16.88	7.50 6.51	4.00 3.52
24255	Spaulding & Watson, Skowhegan, Me. Standard 20% Dairy Ration	Skowhegan	G 20.00 F 19.22	10.00 7.24	4.50 4.53
24180	J. M. Tanguay, Inc., Greene, Me. Our Own 18% Dairy Ration	Greene	G 18.00 F 19.44	12.00 7.55	5.00 3.79
24182	Our Own Fitting Ration	Greene	G 16.00 F 18.06	8.00 8.47	3.75 4.36
24154	Charles E. Thurston & Sons, Danville, Me. Special Formula Dairy Ration	Danville	G 18.00 F 20.62	9.00 7.09	4.00 3.63
24152	Thurston Hog Ration	Danville	G 16.00 F 16.19	8.00 5.84	4.00 4.48
24195	United Cooperative Farmers, Inc., Fitchburg, Mass. United Farmers Fitting Ration	Rockland	G 12.00 F 15.38	9.00 6.06	3.50 3.50
24197	United Farmers Horse Feed	Rockland	G 10.50 F 12.44	6.50 7.73	3.50 3.93
24196	United Farmers 16% Dairy	Rockland	G 16.00 F 20.06	10.00 6.82	3.50 3.80
24310	Unity Feeds, Inc., Boston, Mass. Paycheck 18% Dairy Ration	Old Town	G 18.00 F 20.88	11.00 6.30	4.00 3.98
24308	Unity 18% Dairy Ration	Old Town	G 18.00 F 22.38	10.00 6.74	4.00 4.36
24309	Unity Fitting Ration	Old Town	G 12.00 F 15.69	7.00 6.91	4.00 5.21
24307	Unity Horse Feed	Old Town	G 10.00 F 15.38	9.00 8.60	3.00 4.15
24076	Webber Grain & Feed Co., Westbrook, Me. Clover Bee Dairy Feed 18%	Westbrook	G 18.00 F 19.00	10.00 6.93	4.50 3.52
24072	Clover Bee Hog Ration Complete	Westbrook	G 20.00 F 10.44	7.50 7.27	4.00 2.87
24236	H. K. Webster Co., Lawrence, Mass. Blue Seal 18% Dairy Ration	South Paris	G 18.00 F 20.06	9.00 8.44	4.00 4.90
24069	Blue Seal Fitting Ration with Vitamin D Yeast	Gorham	G 14.00 F 15.69	9.00 8.12	3.00 4.21
24179	Blue Seal Pig Feed with Vitamin D Yeast	Lewiston	G 15.00 F 18.50	6.00 5.27	4.00 4.61
24235	Blue Seal Richford 16% Dairy Ration	South Paris	G 16.00 F 17.56	10.00 7.91	3.00 4.16
24234	Blue Seal Stock Feed	South Paris	G 8.50 F 12.44	17.00 12.69	3.00 2.72
24176	Blue Seal Succulent Feed	Lewiston	G 10.00 F 13.13	18.00 11.34	1.50 4.45

FEEDING STUFFS—Continued

Station number	Name and Address of Manufacturer or Wholesaler and Name of Goods	Where taken	Protein	Fiber	Fat
	Poultry Feeds		%	%	%
24212	Bailey Bros., East Poland, Me. Bailey Bros. Growing Feed	East Poland	G* 17.00 F* 18.88	7.00 5.44	4.00 4.58
24211	Bailey Bros. Laying Mash	East Poland	G 17.00 F 18.88	7.00 6.16	4.00 5.01
24284	Beacon Milling Co., Inc., Cayuga, N. Y. Beacon Battery Laying Ration	Ellsworth	G 16.00 F 17.44	7.75 6.71	3.50 4.35
24080	Beacon Breeders Mash	Westbrook	G 20.00 F 20.44	7.50 5.16	3.50 4.21
24282	Beacon Bulky Developer Grain	Ellsworth	G 9.00 F 13.69	5.00 4.09	2.00 2.82
24287	Beacon C. C. Pellets	Ellsworth	G 15.00 F 18.19	5.00 4.33	1.00 8.25
24283	Beacon Complete Starting	Ellsworth	G 20.00 F 21.31	6.50 4.36	3.50 3.88
24226	Beacon Egg Mash	Norway	G 20.00 F 22.00	7.00 5.92	3.50 4.80
24285	Beacon 18% Growing Mash	Ellsworth	G 18.00 F 19.88	7.50 5.63	3.50 3.85
24286	Beacon Fleshing Pellets	Ellsworth	G 17.00 F 18.63	7.50 6.80	3.25 3.53
24231	Beacon Special 18%	Norway	G 18.00 F 20.19	9.00 7.33	3.50 3.97
24228	Beacon Special Scratch Grains	Norway	G 9.00 F 13.00	5.00 3.69	2.00 2.25
24288	Beacon Turkey Fitting Ration	Ellsworth	G 10.00 F 15.38	9.00 7.85	3.00 3.07
24082	Beacon Turkey Grower Mash	Westbrook	G 20.00 F 20.62	7.00 5.18	3.50 4.03
	Chas. M. Cox Co., Boston, Mass. Dri-Ration Poultry Mash	Portland	G 18.00 F 18.75	7.00 5.13	3.00 2.87
24122	Wirthmore Complete Breeder Mash	Portland	G 15.00 F 17.00	6.00 5.16	3.00 3.50
24123	Wirthmore Complete Egg Ration	Portland	G 15.00 F 17.19	6.00 4.59	3.00 3.43
24128	Wirthmore Complete Growing Ration	Portland	G 15.00 F 16.06	7.00 5.45	3.00 3.13
24127	Wirthmore Growing Mash	Portland	G 17.50 F 19.69	7.00 4.69	3.00 3.06
24121	Wirthmore Laying Mash	Portland	G 20.00 F 20.06	7.00 4.59	3.00 3.61
24326	Wirthmore Poultry Flush	Morrill	G 17.50 F 18.50	6.00 5.75	3.00 3.39
24120	Wirthmore Scratch Feed	Portland	G 9.50 F 13.38	4.00 3.33	2.50 2.70
24132	Wirthmore Starter and Broiler Ration	Portland	G 20.00 F 22.00	6.50 6.41	3.00 4.25
24125	Wirthmore Turkey Fattening Ration	Portland	G 16.00 F 17.75	7.00 4.72	3.00 3.27
	O. B. Cummings & Sons Co., Norway, Me.				
24213	Cummings Scratch Feed	Norway	G 10.00 F 13.81	4.00 3.34	3.00 2.50
24216	N. E. C. Growing and Laying Mash	Norway	G 15.50 F 18.75	7.00 6.61	3.50 4.91
24332	Delaware Mills, Inc., Deposit, N. Y. Delaware Egg Mash	Waldoboro	G 19.00 F 21.00	9.00 6.56	3.00 3.71

* These letters indicate guaranteed and found, respectively.

FEEDING STUFFS—Continued

Station number	Name and Address of Manufacturer or Wholesaler and Name of Goods	Where taken	Protein	Fiber	Fat
	Poultry Feeds—Continued		%	%	%
24333	Delaware Grow Mash	Waldoboro	G* 15.50 F* 18.75	9.00 5.24	3.00 3.00
24049	Delaware Laying Mash	South Portland	G 20.00 F 18.69	8.00 5.46	3.00 3.85
24052	Delaware Milk Flushing Mash	South Portland	G 12.00 F 15.50	6.00 3.82	2.00 2.71
24329	Delaware Scratch Grains	Waldoboro	G 10.00 F 13.00	4.00 3.98	2.00 2.70
24199	Delaware Starter and Broiler Ration	Rockland	G 18.00 F 18.50	7.00 5.58	3.50 3.54
24053	Delaware Turkey Growing Mash	South Portland	G 20.00 F 18.00	7.00 5.45	3.00 3.52
24330	Delaware 18% Growing Mash	Waldoboro	G 17.00 F 19.31	7.00 5.70	3.00 3.14
24331	Delaware 20% Laying Mash	Waldoboro	G 20.00 F 20.62	8.00 5.78	3.00 3.09
24250	Dietrich & Gambrell, Inc., Frederick, Md. All Mash Layer	Norridgewock	G 15.00 F 18.75	8.00 6.30	3.50 3.57
24254	D & G Growing and Fitting Ration	Norridgewock	G 13.00 F 17.00	10.00 7.54	4.00 3.74
	Eastern States Farmers' Exchange, West Springfield, Mass.				
24162	Eastern States All Mash Developer	Auburn	G 14.00 F 16.88	6.00 5.06	2.50 3.57
24159	Eastern States All Mash Egg	Auburn	G 15.50 F 17.58	5.50 4.48	3.00 3.40
24165	Eastern States Developer	Auburn	G 18.00 F 20.31	6.50 5.78	2.50 3.73
24158	Eastern States Egg Mash	Auburn	G 20.00 F 20.06	7.00 5.34	3.00 4.30
24160	Eastern States Finishing Mash	Auburn	G 15.00 F 17.94	5.50 4.83	3.00 3.11
24161	Eastern States Scratch Grains	Auburn	G 9.50 F 13.38	5.00 4.33	2.50 3.57
24163	Eastern States Starting and Broiler Ration	Auburn	G 18.00 F 20.06	6.50 5.17	2.50 3.61
24239	Elmore Milling Co., Inc., Oneonta, N. Y. Elmore Breeder Mash	Oxford	G 20.00 F 21.56	8.00 6.50	4.00 5.27
24203	Elmore Complete Layer and Breeder	Camden	G 16.00 F 17.75	6.00 5.55	4.00 4.29
24204	Elmore Complete Market Egg Mash	Camden	G 15.00 F 17.19	8.00 6.63	4.00 3.58
24087	Elmore Egg Mash	Saco	G 18.00 F 20.62	8.00 6.99	4.00 5.16
24243	Elmore Fleshing Pellets	Oxford	G 15.00 F 15.69	6.00 5.65	5.00 3.72
24202	Elmore Growing Mash	Camden	G 17.00 F 20.19	8.00 6.71	4.00 4.81
24241	Emergency Scratch Feed	Oxford	G 10.00 F 13.00	7.00 3.03	2.50 2.89
	John W. Eshelman & Sons, Lancaster, Pa.				
24209	Eshelman Red Rose Laying Mash with A and D Oil	Augusta	G 18.50 F 19.69	7.50 6.61	4.00 3.97
24210	Eshelman Red Rose Scratch Grains	Augusta	G 9.00 F 12.88	4.00 3.65	2.00 2.86

* These letters indicate guaranteed and found, respectively.

FEEDING STUFFS—Continued

Station number	Name and Address of Manufacturer or Wholesaler and Name of Goods	Where taken	Protein	Fiber	Fat
			%	%	%
	Poultry Feeds—Continued				
24314	Flory Milling Co., Bangor, Pa. Flory Complete All Mash Ration	Unity	G* 15.00 F* 16.19	7.00 4.63	3.50 3.77
24344	Flory Egg and Breeder Mash	North Edgecomb	G 21.00 F 20.48	7.50 5.54	4.00 4.82
24343	Flory Laying Mash	North Edgecomb	G 20.00 F 20.88	7.50 6.16	3.50 4.27
24318	Flory Scratch Feed	Unity	G 9.00 F 14.63	4.00 3.58	2.50 2.29
24100	General Mills, Inc., Fitchburg, Mass. Farm Service Laying Mash	Biddeford	G 20.00 F 21.69	8.00 6.44	3.50 4.70
24309	Farm Service Scratch Feed	Winslows Mills	G 10.00 F 14.25	5.00 4.14	2.50 2.80
24300	General Mills, Inc., Detroit, Mich. Larro Breeder Mash	Hampden	G 20.00 F 21.13	8.00 5.33	4.00 4.48
24095	Larro Broiler Feed	Biddeford	G 18.00 F 19.56	7.00 4.86	3.00 3.84
24098	Larro Chick Builder	Biddeford	G 19.00 F 19.31	7.00 5.39	3.00 3.93
24296	Larro Chick Grains	Hampden	G 9.50 F 13.13	4.00 2.46	2.00 3.39
24096	Larro Egg Mash	Biddeford	G 18.00 F 19.31	8.00 6.07	3.25 3.59
24209	Larro 18% Broiler Feed	Hampden	G 18.00 F 19.44	7.00 4.94	3.00 4.47
24297	Larro Growing Grains	Hampden	G 9.50 F 13.56	4.00 2.98	2.00 4.05
24298	Larro Scratch Grains	Hampden	G 9.50 F 12.44	4.00 3.67	2.00 3.04
24279	A. W. Gilpatrick, Searsport, Me. Gilpatrick 3 and 1 Mash	Searsport	G 17.00 F 18.88	6.00 5.50	5.00 4.27
24143	D. H. Grandin Milling Co., Jamestown, N. Y. Grandin's Hi-Pro Pellets	Portland	G 20.00 F 20.06	8.00 6.14	4.00 4.03
24138	Grandin's Laying Mash	Portland	G 18.00 F 18.88	8.00 5.01	3.50 3.50
24201	Grandin's Special Scratch Grains	Rockland	G 10.00 F 13.56	5.00 3.35	2.50 2.81
24139	Grandin's Start to Finish Mash	Portland	G 18.00 F 18.88	8.00 5.81	4.00 4.04
24075	Hales & Hunter Co., Chicago, Ill. Red Comb Egg Mash	Westbrook	G 18.00 F 19.00	7.00 5.81	3.50 3.69
24077	Red Comb Growing Mash	Westbrook	G 16.00 F 20.44	7.00 5.53	3.50 3.57
24194	Kasco Mills, Inc., Waverly, N. Y. Apex Scratch Grains	Coopers Mills	G 9.00 F 13.00	4.00 3.22	2.50 2.78
24190	Kasco Egg Producer	Coopers Mills	G 20.00 F 20.75	7.50 6.35	3.00 4.61
24192	Kasco Laying and Breeder Ration (All Mash)	Coopers Mills	G 15.00 F 17.00	6.50 6.42	3.00 3.02
24193	Kasco Poultry Flushing Mash	Coopers Mills	G 17.00 F 18.06	6.00 6.74	3.50 3.84

* These letters indicate guaranteed and found, respectively.

FEEDING STUFFS—Continued

Station number	Name and Address of Manufacturer or Wholesaler and Name of Goods	Where taken	Protein	Fiber	Fat
			%	%	%
Poultry Feeds—Continued					
24223	Maritime Milling Co., Buffalo, N. Y. B. B. Egg Mash	Norway	G* 20.00 F* 22.00	9.00	3.50 3.09
24222	Dairy Growing Mash	Norway	G 17.00 F 19.19	8.00	3.50 2.71
24220	Dollar Maker Egg Mash	Norway	G 19.00 F 19.19	8.00	3.50 4.03
24184	D. H. Maxim Estate, Winthrop, Me. Maxim's Scratch Feed	Winthrop	G 9.50 F 13.00	6.00	2.50 3.04
24117	Morrill's Coal & Grain Co., Portland, Me. Garsoe Bros. Growing Mash	Portland	G 14.00 F 17.75	7.00	4.00 4.28
24116	Garsoe Bros. Laying Mash	Portland	G 18.50 F 16.09	7.00	4.00 4.20
24032	New England Grain Co., Portland, Me. New England Complete Laying Mash	Portland	G 15.00 F 15.13	6.00	5.00 3.97
24031	New England Egg Mash	Portland	G 20.00 F 16.50	7.00	5.00 3.84
24293	New England Scratch Feed	Ellsworth	G 10.00 F 14.25	5.00	3.00 2.38
24033	New England Sterling Laying Mash	Portland	G 18.00 F 18.31	8.00	5.00 4.30
24034	New England Sterling Starter and Growing Feed	Portland	G 17.00 F 17.56	8.00	5.03 4.15
24028	3 in 1 Mash. Starting, Growing and Laying	Portland	G 17.00 F 17.19	6.00	5.00 4.10
24233	Paris Farmers Union, South Paris, Me. Sunshine Mash. Starter, Laying, and Growing	South Paris	G 17.00 F 16.88	8.00	3.00 5.24
24062	Paris Flouring Co., Portland, Me. New England Conference Laying Mash with Cod Liver Oil	Portland	G 18.20 F 15.75	6.70	5.40 4.75
24112	Park & Pollard Co., Buffalo, N. Y. Lay or Bust Dry Mash	Biddeford	G 18.00 F 19.31	7.00	3.00 3.32
24106	Park & Pollard Breeder Mash— A Lay or Bust Feed	Biddeford	G 20.00 F 21.31	7.00	3.00 3.87
24104	Park & Pollard Chick Starter— A Lay or Bust Feed	Biddeford	G 17.00 F 21.00	6.00	3.00 3.00
24115	Park & Pollard Economy Scratch	Biddeford	G 10.00 F 11.88	5.00	1.50 2.67
24108	Park & Pollard Fleshing Pellets	Biddeford	G 16.00 F 19.88	7.00	3.00 5.33
24113	Park & Pollard Growing Feed	Biddeford	G 16.00 F 17.00	7.00	3.00 3.46
24109	Park & Pollard Layer and Breeder Pellets	Biddeford	G 20.00 F 21.56	6.50	3.00 3.53
24334	Park & Pollard Starter and Broiler Mash	Waldoboro	G 18.00 F 21.31	6.00	3.50 3.09

* These letters indicate guaranteed and found, respectively.

FEEDING STUFFS—Continued

Station number	Name and Address of Manufacturer or Wholesaler and Name of Goods	Where taken	Protein	Fiber	Fat
			%	%	%
Poultry Feeds—Continued					
24105	Park & Pollard Turkey Grower— A Lay or Bust Feed	Biddeford	G* 20.00 F* 23.50	7.00 7.45	3.00 3.34
24070	Quaker Oats Co., Chicago, Ill. Ful-O-Pep Broiler Mash	South Windham	G 19.00 F 21.81	8.00 5.48	4.00 4.26
24275	Ralston Purina Co., St. Louis, Mo. Purina Breeder Lay Chow	Belfast	G 22.00 F 22.38	8.00 6.67	3.50 5.61
24274	Purina Breeder Layena Complete Ration	Belfast	G 15.50 F 17.19	8.00 4.78	3.50 4.12
24147	Purina Chick Growena	Portland	G 17.00 F 18.75	7.00 4.97	3.50 4.10
24172	Purina Hen Chow	Belfast	G 10.00 F 14.75	7.00 5.02	2.00 2.75
24144	Purina Layena Complete Ration	Portland	G 15.50 F 17.19	8.00 4.58	3.50 3.88
24174	Sawyer Grain Co., Lewiston, Me. Pine Tree Hen Scratch	Lewiston	G 10.00 F 12.53	4.00 4.41	3.00 3.22
24170	Sawyer Chick Starting Mash	Lewiston	G 19.00 F 19.88	4.50 5.11	5.00 3.29
24173	Sawyer Growing Mash	Lewiston	G 16.00 F 19.00	5.50 5.02	4.50 3.23
24172	Sawyer Laying Mash	Lewiston	G 18.00 F 19.56	5.00 4.87	4.53 3.30
24183	J. M. Tanguay, Inc., Greene, Me. Our Own New England Conference Laying Mash	Greene	G 18.00 F 16.97	6.00 6.53	5.00 3.91
24181	Our Own Scratch Feed	Greene	G 9.00 F 12.44	4.00 3.21	2.50 3.10
24153	Charles E. Thurston & Sons, Danville, Me. Thurston's Breeder Mash	Danville	G 18.00 F 18.75	7.00 4.87	4.00 4.62
24153	Thurston's Money Maker Egg Mash	Danville	G 18.00 F 18.19	7.00 5.76	4.00 4.18
24198	United Cooperative Farmers, Inc., Fitchburg, Mass. United Farmers Layer	Rockland	G 18.00 F 19.69	8.00 4.45	3.00 3.51
24311	Unity Feeds, Inc., Boston, Mass. Life Saver Mash. Starter, Grower, Layer	Old Town	G 17.00 F 20.88	8.00 5.38	3.00 3.44
24305	Unity Breeder Mash	Old Town	G 18.00 F 22.50	7.00 6.37	3.00 3.85
24306	Unity Scratch Feed	Old Town	G 10.00 F 14.94	5.00 2.97	2.50 2.06
24074	Webber Grain & Feed Co., Westbrook, Me. Clover Bee Laying Mash	Westbrook	G 18.00 F 16.57	8.00 4.74	4.00 4.07
24178	H. K. Webster Co., Lawrence, Mass. Blue Seal All Mash Egg Ration	Lewiston	G 15.00 F 17.00	5.50 5.07	4.00 3.66
24067	Blue Seal All Mash Growing Ration	Gorham	G 14.50 F 17.44	6.00 5.11	4.00 4.06

* These letters indicate guaranteed and found, respectively.

FEEDING STUFFS—Continued

Station number	Name and Address of Manufacturer or Wholesaler and Name of Goods	Where taken	Protein	Fiber	Fat
	Poultry Feeds—Concluded		%	%	%
24008	Blue Seal Chick Starter	Gorham	G* 19.00 F* 22.00	6.50 5.88	4.00 3.40
24175	Blue Seal Egg Mash	Lewiston	G 18.00 F 19.88	6.50 5.67	4.00 3.77
24006	Blue Seal Growing Mash	Gorham	G 18.00 F 20.19	7.00 6.18	4.00 4.88
24177	Blue Seal Scratch Feed	Lewiston	G 10.00 F 12.69	4.00 3.63	2.50 3.73
	WHEAT PRODUCTS				
	Bran				
24149	Bay State Milling Co., Winona, Minn. Wingold Pure Hard Wheat Bran	Portland	G 15.50 F 17.75	12.00 10.53	4.50 5.33
24038	S. J. Cherry & Sons, Ltd., Preston, Can. Wheat Bran	Portland	G 14.00 F 18.06	11.50 9.19	3.50 5.20
24060	Federal Mills, Inc., Lockport, N. Y. Dairy Maid Soft Winter Wheat Bran	South Portland	G 13.50 F 15.81	13.00 10.44	3.50 3.63
24102	General Mills, Inc., Minneapolis, Minn. Washburn Gold Medal Hard Wheat Bran with Screenings	Biddeford	G 14.00 F 17.00	12.00 11.78	3.50 4.75
24244	Gwinn Milling Co., Columbus, O. Gwinn's Pure Wheat Bran	Auburn	G 14.00 F 14.38	12.00 10.85	4.00 4.16
24079	International Milling Co., Minneapolis, Minn. Blackhawk Wheat Bran WGSNEMR 8%	Westbrook	G 15.00 F 18.63	12.00 8.84	2.50 4.11
24039	Larabee Flour Mills Co., Kansas City, Mo. Sunfed Winter Wheat Bran WGWSNEMR 8%	Portland	G 15.00 F 18.63	11.00 9.63	3.50 4.35
24261	Loudonville Milling Co., Loudonville, O. Le Grande Winter Wheat Bran	Skowhegan	G 13.00 F 15.13	12.00 9.79	4.00 4.08
24249	Mayflower Mills Co., Fort Wayne, Ind. Mayflower Bran	North Jay	G 13.00 F 15.50	11.00 10.31	3.00 3.68
24064	Parrish & Helmbecker, Ltd., Toronto, Can. Parrheim Pure Wheat Bran	Buxton	G 15.00 F 18.19	8.00 8.54	5.00 5.46
24065	Parrheim Pure Wheat Bran	Buxton	G 15.00 F 19.00	11.50 8.46	3.50 6.04
24224	Pillsbury Flour Mills Co., Minneapolis, Minn. Pillsbury Hard Wheat Bran WGSNEMR	Norway	G 14.00 F 15.81	12.00 11.35	4.00 5.45
24083	Quaker Oats Co., Chicago, Ill. Bell Cow Wheat Bran	Saco	G 15.00 F 17.94	11.50 10.77	3.50 5.32

* These letters indicate guaranteed and found, respectively.

FEEDING STUFFS—Continued

Station number	Name and Address of Manufacturer or Wholesaler and Name of Goods	Where taken	Protein	Fiber	Fat
			%	%	%
	Bran—Concluded				
	Russell-Miller Milling Co., Minneapolis, Minn.				
21258	Hard Wheat Occident Bran	Skowhegan	G* 14.00 F* 17.19	11.50 10.57	4.00 4.67
	Standard Tilton Div., Alton, Ill.				
24259	American Beauty Pure Wheat Bran	Skowhegan	G 14.50 F 17.94	9.50 9.92	4.50 4.77
	Valier & Spies Milling Co., St. Louis, Mo.				
24133	Valier's Pure Wheat Bran	Portland	G 14.50 F 17.31	10.50 10.04	3.50 3.98
	Voigt Milling Co., Grand Rapids, Mich.				
24110	Voigt's Pure Winter Wheat Bran	Biddeford	G 14.00 F 15.81	10.00 9.69	3.00 3.55
	Feed Flours				
	Federal Mills, Inc., Lockport, N. Y.				
24058	Lucky Wheat Red Dog	South Portland	G 15.00 F 18.63	4.00 3.47	2.50 4.38
	General Mills, Inc., Minneapolis, Minn.				
24338	Washburn Gold Medal Hard Wheat Adrian Red Dog	Winslows Mills	G 16.00 F 20.75	4.00 3.27	3.50 5.46
	Middlings and Shorts				
	Bay State Milling Co., Winona, Minn.				
24150	Wingold Standard Hard Wheat Middlings and Wheat Screenings	Portland	G 16.50 F 19.00	9.50 8.68	4.00 5.89
	Blackburn Milling Co., Omaha, Nebr.				
24246	Wheat Flour Middlings with Screenings	Auburn	G 16.00 F 19.19	6.00 5.69	3.50 4.62
	Federal Mills, Inc., Lockport, N. Y.				
24059	Dairy Maid Wheat Flour Middlings WGSNEMR	South Portland	G 13.50 F 15.94	6.00 5.92	3.50 3.88
	Lucky Hard Wheat Standard Middlings	South Portland	G 16.00 F 18.06	9.50 6.90	4.00 4.71
	General Mills, Inc., Minneapolis, Minn.				
24101	Washburn Gold Medal Hard Wheat Standard Middlings with Screenings	Biddeford	G 15.00 F 19.00	9.50 7.03	4.00 5.45
	Gwinn Milling Co., Columbus, O.				
24245	Gwinn's Wheat Middlings	Auburn	G 15.00 F 16.63	6.00 4.25	4.00 3.98
	Loudonville Milling Co., Loudonville, O.				
24262	Winter Wheat Middlings	Skowhegan	G 15.00 F 14.94	7.00 7.34	4.00 4.20
	Maple Leaf Milling Co., Ltd., Toronto, Can.				
21094	Rex Wheat Middlings	Saco	G 16.00 F 18.19	9.00 8.12	5.00 5.56
	Mayflower Mills Co., Fort Wayne, Ind.				
24248	Mayflower Middlings	North Jay	G 14.00 F 15.94	9.00 8.16	4.00 4.15
	Quaker Oats Co., Chicago, Ill.				
24084	Bell Cow Wheat Shorts	Saco	G 16.00 F 18.63	8.00 8.65	4.00 6.21

* These letters indicate guaranteed and found, respectively.

FEEDING STUFFS—Concluded

Station number	Name and Address of Manufacturer or Wholesaler and Name of Goods	Where taken	Protein	Fiber	Fat
			%	%	%
	Middlings and Shorts—Concluded				
24237	Valter & Spies Milling Co., St. Louis, Mo. Grey Wheat Shorts and Wheat Screenings	Norway	G* 16.00 F* 17.19	6.00 6.89	4.00 4.35
24260	Voigt Milling Co., Grand Rapids, Mich. Voigt Middlings (Winter Wheat) WGSNEMR	Waterville	G 14.50 F 16.38	10.00 5.54	4.00 4.79
	Mixed Feeds				
24046	Excelsior Milling Co., Minneapolis, Minn. Camel Wheat Mixed Feed	Portland	G 15.00 F 17.44	8.50 7.9	4.00 4.31
24057	Federal Mills, Inc., Lockport, N. Y. Dairy Maid Wheat Mixed Feed WGSNEMR	South Portland	G 13.00 F 16.19	9.55 8.44	3.00 4.08
24319	Royal Lily Special Mix Feed	Unity	G 13.00 F 14.75	8.00 7.65	5.00 4.33
24103	General Mills, Inc., Minneapolis, Minn. Washburn Gold Medal Fancy Wheat Mixed Feed	Biddeford	G 15.00 F 19.31	7.50 6.70	3.50 5.20
24260	Loudonville Milling Co., Loudonville, O. Winter Wheat Mixed Feed	Skowhegan	G 15.00 F 15.25	7.00 8.31	4.00 3.98
24247	Mayflower Mills Co., Fort Wayne, Ind. Mayflower Mix Feed	North Jay	G 14.00 F 16.06	10.00 7.84	3.80 4.08
24257	Russell-Miller Milling Co., Minneapolis, Minn. Hard Wheat Occident Mix Feed	Skowhegan	G 15.00 F 17.44	9.50 8.69	4.50 5.08
24313	Valter & Spies Milling Co., St. Louis, Mo. Valter Mixed Feed and Screenings	Unity	G 15.50 F 17.31	8.50 7.78	3.53 4.09
24208	Voigt Milling Co., Grand Rapids, Mich. Voigt's Winter Wheat Mixed Feed	Waterville	G 14.50 F 15.13	10.00 8.36	4.00 4.76
	Miscellaneous Feeds				
24214	C. B. Cummings & Sons Co., Norway, Me. 90% Corn Meal	Norway	G 9.00 F 10.19	3.00 2.87	4.00 4.28
24134	Hood Mills Co., Baltimore, Md. Ground Oats, With Other Grains Added	Portland	G 10.00 F 12.19	14.00 11.18	2.00 1.87
24048	McCabe Bros. Grain Co., Ltd., Winnipeg, Can. Ground Grains Screenings	Portland	G 13.00 F 15.81	16.00 15.53	5.00 8.63
24256	Spaulding & Watson, Skowhegan, Me. Ground Feed	Skowhegan	G 10.00 F 11.56	6.00 5.54	4.00 3.95
24304	Zellers Laboratories, Reading, Pa. Vita-Gee	Bangor	G 32.00 F 35.07	4.50 4.98	0.50 5.30

* These letters indicate guaranteed and found, respectively.

DEFINITIONS OF FEEDINGSTUFFS*

ALFALFA PRODUCTS

1. **Chopped Alfalfa or Cut Alfalfa** is the entire alfalfa hay, chopped or cut and not ground finely enough to become a meal. It must not contain an admixture of alfalfa straw or other foreign material. (Adopted prior to 1928—Amended 1937.)

2. **Alfalfa Meal** is the product obtained from the grinding of the entire alfalfa hay, without the addition of any alfalfa stems, alfalfa straw or foreign material, or the abstraction of leaves. It must be reasonably free from other crop plants and weeds, and must not contain more than 33 per cent of crude fibre. (Adopted 1928.)

3. **Alfalfa Leaf Meal** is the ground product consisting chiefly of leafy materials separated from alfalfa hay or meal. It must be reasonably free from other crop plants and weeds and must not contain more than 18 per cent of crude fibre. (Adopted 1928—Amended 1938.)

4. **Alfalfa Stem Meal** is the ground product remaining after the separation of the leafy material from alfalfa hay or meal. It must be reasonably free from other crop plants and weeds. (Adopted 1928.)

(NOTE)—The word "dehydrated" may precede the official definitions for alfalfa products provided the product has been artificially dried. (Adopted 1940.)

(NOTE)—A guarantee of the crude carotene content expressed in parts per million, accompanied by an expiration date, may be included on the label if the producer so desires. (Adopted 1941.)

ANIMAL PRODUCTS

5. **Blood Meal** is ground, dried blood. (Adopted 1926.)

6. **Blood Flour** is dried blood, prepared by special processes and reduced to a fine powder. (Adopted prior to 1928.)

7. **Meat** is the clean, wholesome flesh derived from slaughtered mammals and is limited to that part of the striate muscle which is skeletal or that which is found in the tongue, in the diaphragm, in the heart, or in the esophagus, and does not include that found in the lips, in the snout, or in the ears; with or without the accompanying and overlying fat and the portions of skin, sinew, nerve, and blood vessels which normally accompany the flesh. If it bears a name descriptive of its kind it must correspond thereto.

The term "meat" when applied to the corresponding portions of animals other than cattle, swine, sheep, and goats shall be used in qualified form, as, for example, "horse meat," "reindeer meat," "crab meat," etc. (Adopted 1938—Amended 1939.)

8. **Meat By-Products** consist of any non-rendered, clean, wholesome part of the carcass of slaughtered mammals other than meat, such as lungs, spleens, kidneys, brains, stomach and intestines free from their contents; it does not include skin, horns, teeth, hoofs, and bones. If it bears a name descriptive of its kind it must correspond thereto.

* As published by the Association of American Feed Control Officials, Inc., 1944.

The term "meat by-products" when applied to the corresponding portions of animals other than cattle, swine, sheep, and goats shall be used in qualified form, as, for example, "horse meat by-products," "reindeer meat by-products," "crab meat by-products," etc. (Adopted 1938—Amended 1939.)

9. Meat Meal is the ground, dry-rendered residue from animal tissues exclusive of hoof, horn, blood, manure, and stomach contents, except in such traces as might occur unavoidably in good factory practice. When this product contains more than 4.4 per cent of phosphorus (P), it must be designated "..... Per Cent Protein Meat and Bone Meal." If it bears a name descriptive of its kind, composition, or origin it must correspond thereto. (Adopted 1939—Amended 1942.)

10. Meat Scrap is the ground, dry-rendered residue from animal tissues exclusive of hoof, horn, blood, manure, and stomach contents, except in such traces as might occur unavoidably in good factory practice. When this product contains more than 4.4 per cent of phosphorus (P), it shall be designated "..... Per Cent Protein Meat and Bone Scrap." If it bears a name descriptive of its kind, composition or origin it must correspond thereto. (Adopted 1928—Amended 1936, 1938.)

NOTE: The designation "Meat Scrap" and "Meat and Bone Scrap" must not be used in connection with food for dogs and fur-bearing animals. (Adopted 1942.)

11. Digester Tankage, Meat Meal Tankage or Feeding Tankage is the residue from animal tissues exclusive of hoof, horn, manure and stomach contents, except in such traces as might occur unavoidably in good factory practice, especially prepared for feeding purposes by tanking under live steam or by dry rendering or a mixture of the products; made suitable by drying and grinding. It must not contain more than 4.4 per cent of phosphorus (P). If it bears a name descriptive of its kind, composition or origin, the material must correspond thereto. (Adopted 1928—Amended 1933, 1936, 1938.)

12. Digester Tankage with Bone, Meat and Bone Meal Digester Tankage, Meat and Bone Meal Tankage, or Feeding Tankage with Bone is the residue from animal tissues exclusive of hoof, horn, manure and stomach contents, except in such traces as might occur unavoidably in good factory practice, especially prepared for feeding purposes by tanking under live steam or by dry rendering or a mixture of the products; made suitable by drying and grinding, and containing more than 4.4 per cent of phosphorus (P). If it bears a name descriptive of its kind, composition or origin, it must correspond thereto. (Adopted 1928—Amended 1933, 1936, 1938.)

13. Whale Meal is prepared from the clean, dried undecomposed flesh of the whale, after part of the oil has been extracted. It contains not more than 3 per cent of salt (NaCl). If it contains more than 3 per cent of salt (NaCl) the amount of salt must constitute a part of the brand name, provided that in no case shall the salt content of this product exceed 7 per cent. (Adopted 1933.)

14. Animal Liver Meal is the product obtained by drying and grinding liver from slaughtered mammals. This product must contain at least 60 micrograms of riboflavin per gram. (Adopted 1943.)

15. Animal Liver and Glandular Meal is the product obtained by drying and grinding liver and other glandular tissue from slaughtered mammals. At least 50 per cent of the dry weight of the product must be derived from liver and the product must contain at least 40 micrograms of riboflavin per gram. (Adopted 1943.)

16. Raw Bone Meal is the dried, ground product suitable for animal feeding, obtained by cooking in water at atmospheric pressure, undecomposed bone, just enough to remove excess fat and meat. It must not contain less than 23 per cent of protein. (Adopted 1929.)

17. Steamed Bone Meal is the dried, ground product suitable for animal feeding, obtained by cooking bones with steam under pressure. (Adopted 1929.)

18. Special Steamed Bone Meal is the dried, ground product suitable for animal feeding, obtained by cooking dried bones after the removal of grease and meat fibre with steam under pressure in the process of obtaining gelatine or glue. (Adopted 1929.)

19. Bone Charcoal or Bone Black is the product obtained by charring bones in closed retorts. It shall contain not less than 14.7 per cent of phosphorus (P). (Adopted 1938.)

20. Spent Bone Black is the product resulting from the repeated charring of bone charcoal or bone black after use in clarifying sugar solutions. It shall contain not less than 11.5 per cent of phosphorus (P). (Adopted 1938.)

BARLEY PRODUCTS

21. Barley Hulls is the product consisting of the outer coverings of the barley. (Adopted prior to 1928.)

22. Barley Feed is the entire by-product resulting from the manufacture of pearl barley from clean barley. (Adopted prior to 1928.)

23. Barley Mixed Feed is the entire offal from the milling of barley flour from clean barley and is composed of barley hulls and barley middlings. (Adopted prior to 1928.)

24. Ground Barley is the entire product obtained by grinding clean sound barley, containing not less than 90 per cent of pure barley and not more than 10 per cent of other grains, weed seeds and other foreign material and not more than 6 per cent of crude fibre; provided that no portion of this stated 10 per cent of other grains, weed seeds or other foreign material shall be intentionally added. (Adopted prior to 1928.)

25. Mixed Feed Barley is the entire product obtained by grinding country run barley containing not less than 75 per cent of pure barley and not more than 25 per cent of other grains, weed seeds and other foreign material; provided that no portion of this stated 25 per cent of other grains, weed seeds or foreign materials shall be intentionally added. The ingredients must be stated as barley, other grains, weed seeds, and foreign material. (Adopted prior to 1928.)

BREWERS' AND DISTILLERS' PRODUCTS

26. Brewers' Dried Grains is the dried extracted residue of barley malt alone or in mixture with other cereal grain or grain products resulting from the manufacture of wort. (Adopted 1936.)

27. Malt Sprouts is the product obtained by the removal of the sprouts from malted barley together with the malt hulls, other parts of malt and foreign material unavoidably present. It shall contain not less than 24 per

cent of protein. The term "Malt Sprouts" when applied to a corresponding portion of other malted cereals shall be used in qualified form, as for example: "Rye Malt Sprouts," "Wheat Malt Sprouts," etc. (Adopted 1942.)

28. Per Cent Protein Malt Cleanings is the product obtained from the cleaning of malted barley or from the recleaning of malt which does not meet the minimum protein standard of malt sprouts. (Adopted 1942.)

29. Malt Hulls is the product consisting almost entirely of hulls as obtained in the cleaning of malted barley. (Adopted 1942.)

30. Corn Distillers' Dried Grains is the dried residue obtained in the manufacture of alcohol and distilled liquors from corn, or from a grain mixture in which corn predominates. (Adopted 1942.)

31. Rye Distillers' Dried Grains is the dried residue obtained in the manufacture of alcohol and distilled liquors from rye, or from a grain mixture in which rye predominates. (Adopted 1942.)

32. Corn Distillers' Dried Grains With Solubles is the dried residue obtained in the manufacture of alcohol and distilled liquors from corn, or from a grain mixture in which corn predominates, and contains the major portion of the condensed screened stillage dried therewith. (Adopted 1943.)

33. Rye Distillers' Dried Grains With Solubles is the dried residue obtained in the manufacture of alcohol and distilled liquors from rye, or from a grain mixture in which rye predominates, and contains the major portion of the condensed screened stillage dried therewith. (Adopted 1943.)

34. Semi-Solid Corn Distillers' Grains With Solubles is the residue from the manufacture of alcohol and distilled liquors from corn, or from a grain mixture in which corn predominates, obtained by condensing to a syrupy consistency the entire stillage contained therein. (Adopted 1943.)

35. Semi-Solid Rye Distillers' Grains With Solubles is the residue from the manufacture of alcohol and distilled liquors from rye, or from a grain mixture in which rye predominates, obtained by condensing to a syrupy consistency the entire stillage contained therein. (Adopted 1943.)

36. Semi-Solid Corn Distillers' Solubles is the product obtained in the manufacture of alcohol and distilled liquors from corn, or from a grain mixture in which corn predominates, by condensing to a syrupy consistency the screened stillage obtained therefrom. (Adopted 1943.)

37. Semi-Solid Rye Distillers' Solubles is the product obtained in the manufacture of alcohol and distilled liquors from rye, or from a grain mixture in which rye predominates, by condensing to a syrupy consistency the screened stillage obtained therefrom. (Adopted 1943.)

38. Dried Corn Distillers' Solubles is the product obtained by drying Semi-Solid Corn Distillers' Solubles. (Adopted 1943.)

39. Dried Rye Distillers' Solubles is the product obtained by drying Semi-Solid Rye Distillers' Solubles. (Adopted 1943.)

40. Molasses Distillers' Solubles is the product obtained by drying the residue from the yeast fermentation of molasses after the removal of the alcohol by distillation. (Adopted 1942.)

41. Yeast Dried Grains or Vinegar Dried Grains is the properly dried residue from the mixture of cereals, malt and malt sprouts (sometimes cottonseed meal) obtained in the manufacture of yeast or vinegar, and consists of corn or corn and rye from which most of the starch has been extracted, together with malt added during the manufacturing process to change the starch to sugar, and malt sprouts (sometimes cottonseed meal) added

during the manufacturing process to aid in filtering the residue from the wort and to serve as a source of food supply for the yeast. (Adopted prior to 1928.)

CORN PRODUCTS

42. Corn Meal is finely ground, unbolted corn. (Adopted prior to 1928.)

43. Corn Bran is the outer coating of the corn kernel, with little or none of the starchy part or germ. (Adopted 1931.)

44. Corn Feed Meal is the fine siftings obtained in the manufacture of screened corn chop, screened ground corn or screened cracked corn, with or without its aspiration products added. (Adopted 1931.)

45. Corn Chop, Ground Corn or Cracked Corn is the entire product made by grinding, cutting or chopping the grains of sound Indian corn, and may be fine, medium or coarse, and must not contain more than 4 per cent of foreign material. (Adopted 1931.)

46. Screened Corn Chop, Screened Ground Corn, or Screened Cracked Corn is the coarse portion of corn chop, ground corn or cracked corn from which most of the fine particles have been removed, and must not contain more than 4 per cent of foreign material. (Adopted 1931.)

47. Corn Grits or Hominy Grits is the product consisting of the fine or medium sized, hard flinty portions of sound Indian corn containing little or none of the bran or germ. (Adopted 1931.)

48. Ear Corn Chops is corn and cob chopped, without the husk, with no greater proportion of cob than occurs in the ear corn in its natural state. (Adopted prior to 1928.)

49. Corn Gluten Feed is that part of commercial shelled corn that remains after the extraction of the larger part of the starch and germ by the processes employed in the wet milling manufacture of corn starch or syrup. It may or may not contain one or more of the following: corn solubles, corn oil meal. (Adopted 1936.)

50. Corn Gluten Meal is that part of commercial shelled corn that remains after the extraction of the larger part of the starch and germ, and the separation of the bran by the process employed in the wet milling manufacture of corn starch or syrup. It may or may not contain one or more of the following: corn solubles, corn oil meal. (Adopted 1936.)

51. Maltose Process Corn Gluten Feed is the dried residue from degermed corn, after removal of the starch in the manufacture of malt syrup. (Adopted prior to 1928.)

52. Hominy Feed is a mixture of corn bran, corn germ and a part of the starchy portion of either white or yellow corn kernels or mixture thereof as produced in the manufacture of pearl hominy, hominy grits or table meal, and shall contain not less than 5 per cent of crude fat. If prefixed with the words "white" or "yellow," the product must correspond thereto. (Adopted 1935.)

53. Corn Oil Cake consists of the corn germ from which part of the oil has been pressed and is the product obtained in the wet milling process of manufacture of corn starch, corn syrup, and other corn products. (Adopted prior to 1928.)

54. Corn Oil Meal is ground corn oil cake. (Adopted prior to 1928.)

55. Corn Germ Cake consists of corn germ with other parts of the corn kernel from which part of the oil has been pressed, and is the product obtained in the dry milling process of manufacture of corn meal, corn grits, hominy feed, and other corn products. (Adopted prior to 1928.)

56. Corn Germ Meal is ground corn germ cake. (Adopted prior to 1928.)

57. Corn Screenings is the product consisting of the small light grains of corn, parts of grains of corn or other cereals, and other materials having feeding value, separately or together, obtained by screening shelled corn, excluding sand, dirt, and other similar inert materials. (Adopted 1931.)

COTTONSEED PRODUCTS

58. Cottonseed Meal is a product of the cottonseed only, composed principally of the kernel with such portion of the hull as is necessary in the manufacture of oil; provided that nothing shall be recognized as cottonseed meal that does not conform to the foregoing definition and that does not contain at least 36 per cent of protein. Cottonseed meal shall be graded and classed as follows: (Adopted prior to 1928.)

59. Per Cent Protein Cottonseed Meal, Prime Quality. Cottonseed meal, prime quality, must be finely ground, not necessarily bolted, of sweet odor, reasonably bright in color, yellowish, not brown or reddish, free from excessive lint, and shall contain not less than 36 per cent of protein. It must be designated and sold according to its protein content. Cottonseed meal with 36 per cent of protein must be termed "36 per cent Protein Cottonseed Meal, Prime Quality," and higher grades similarly designated (as "43 per cent Protein Cottonseed Meal, Prime Quality"), etc. (Adopted prior to 1928.)

60. Per Cent Protein Cottonseed Meal, Off Quality. Cottonseed meal not fulfilling the above requirement as to color, odor and texture must be graded "36 per cent Protein Cottonseed Meal, Off Quality," and higher grades similarly designated. (Adopted prior to 1928.)

61. Per Cent Protein Cottonseed Feed is a mixture of cottonseed meal and cottonseed hulls. It must be designated and sold according to its protein content. (Adopted prior to 1928; amended 1937.)

62. Per Cent Protein Whole Pressed Cottonseed, Prime Quality is the product resulting from subjecting the whole, sound mature, clean, undercorticated cottonseed to pressure for the extraction of oil, and includes the entire cottonseed less the oil extracted and the lint removed. It must be designated and sold according to its protein content. (Adopted 1932.)

63. Per Cent Protein Ground Whole Pressed Cottonseed, Prime Quality is whole pressed cottonseed, ground. It must be designated and sold according to its protein content. (Adopted 1932.)

64. Cottonseed Cake is a product of the cottonseed only, composed principally of the kernel with such portion of the hull as is necessary in the manufacture of oil; provided that nothing shall be recognized as cottonseed cake that does not conform to the following definitions and that does not contain at least 36 per cent of crude protein. Cottonseed Cake shall be graded and classed as follows: (Adopted 1937.)

65. Per Cent Protein Cottonseed Cake, Prime Quality. Cottonseed cake, prime quality, must be firm, but not flinty in texture, of sweet

odor, free of mold, and when ground into meal must produce cottonseed meal, prime quality. It shall contain not less than 36 per cent of crude protein. It must be designated and sold according to its protein content. Cottonseed cake with 43 per cent of crude protein must be termed "43 Per Cent Protein Cottonseed Cake, Prime Quality," and lower grades similarly designated. (Adopted 1937.)

66. Per Cent Protein Cottonseed Cake, Off Quality. Cottonseed cake not fulfilling the above requirement as to color, odor, and texture must be labeled "43 per cent Protein Cottonseed Cake, Off Quality," and lower grades similarly designated. (Adopted 1937.)

67. Per Cent Protein Nut-Size Cottonseed Cake, ... Quality. Nut-size cottonseed cake shall be a product which will pass through $1\frac{1}{2}$ -inch round perforation and over $\frac{3}{8}$ -inch round perforation. It shall be free from meal, pea-size and pebble-size cake and shall not contain in excess of 10 per cent of sheep-size cake. (Adopted 1937.)

68. Per Cent Protein Sheep-Size Cottonseed Cake, ... Quality. Sheep-size cottonseed cake shall be a product which will pass through $\frac{3}{8}$ -inch round perforation and over $\frac{5}{16}$ -inch round perforation. It shall be free from meal and pebble-size cake and shall not contain in excess of a total of 10 per cent of nut-size and pea-size cake. (Adopted 1937.)

69. Per Cent Protein Pea-Size Cottonseed Cake, ... Quality. Pea-size cottonseed cake shall be a product which will pass through $\frac{5}{16}$ -inch round perforation and over $\frac{3}{8}$ -inch round perforation. It shall be free from meal and nut-size cake and shall not contain in excess of 10 per cent of sheep-size and pebble-size cake. (Adopted 1937.)

70. Per Cent Protein Pebble-Size Cottonseed Cake, ... Quality. Pebble-size cottonseed cake shall be a product consisting of fine particles and small pieces of cottonseed cake capable of passing through a $\frac{3}{8}$ -inch round perforation. (Adopted 1937.)

71. Per Cent Protein Cottonseed Cubes or Pellets, Prime Quality. Cottonseed cubes or pellets, prime quality, processed through a cubing or pelleting machine, must be firm, but not flinty, of sweet odor, free of mold, and when ground into meal, must produce cottonseed meal, prime quality. It shall contain not less than 36 per cent of crude protein. It must be designated and sold according to its protein content. (Adopted 1937.)

72. Munsell Color Standard for Cottonseed Cake and Meal, Prime Quality. Whenever in the definitions reference is made to color of cottonseed cake or cottonseed meal, prime quality, 41 per cent or higher protein cottonseed cake or cottonseed meal shall not be darker in color than Munsell Color Standard "1 $\frac{1}{2}$ yellow, 5/5," and 36 per cent protein cottonseed cake or cottonseed meal, prime quality, shall not be darker in color than Munsell Color Standard "10 yellow—red 5/5." (Adopted 1938.)

LESPEDEZA PRODUCTS

73. Lespedeza Meal is the product obtained from the grinding of the entire lespedeza hay, without the addition of any lespedeza stems, lespedeza straw, or foreign material, or the abstraction of leaves. It must be reasonably free from other crop plants and weeds, and must not contain more than 28 per cent of crude fibre. (Adopted 1938.)

74. Lespedeza Stem Meal is the ground product remaining after the separation of the leafy material from lespedeza hay or meal. It must be reasonably free from other crop plants and weeds. (Adopted 1938.)

75. Lespedeza Straw Meal is the ground product remaining after the separation of the seed from lespedeza. It must be reasonably free from other crop plants and weeds. (Adopted 1938.)

LINSEED AND FLAX PRODUCTS

76. Ground Flaxseed or Flaxseed Meal is the product obtained by grinding flaxseed which has been screened and cleaned of weed seeds and other foreign materials by the most improved commercial process; the final product must contain less than 6 per cent of weed seeds and other foreign materials, and, provided further, that no portion of the stated 6 per cent of weed seeds and other foreign materials shall be deliberately added. (Adopted 1943.)

77. Per Cent Protein Linseed Oil Cake or Per Cent Protein Linseed Oil Chips is the product obtained after the removal of part of the oil from ground flaxseed as described above. It shall contain not more than 0.5 per cent of acid insoluble ash. If a name descriptive of the process of manufacture, such as hydraulic, mechanical, or solvent extracted be used, the product must correspond thereto. (Adopted 1943.)

78. Per Cent Protein Linseed Oil Meal is finely ground Linseed Oil Cake or finely ground Linseed Oil Chips. (Adopted 1943.)

79. Per Cent Protein Linseed Cubes or Pellets, processed through a cubing or pelleting machine, must be firm but not flinty, of sweet odor, free of mold, and when ground must produce Linseed Oil Meal as defined above. (Adopted 1943.)

80. Flaxseed Screenings Oil Feed is the ground product obtained after extraction of part of the oil by crushing, cooking, and hydraulic or mechanical pressure, or by crushing, heating and the use of solvents, from the smaller imperfect flaxseed, weed seeds and other foreign materials having feeding value, separated in cleaning flaxseed. (Adopted 1943.)

81. Per Cent Protein Linseed Feed is a mixture of Linseed Oil Meal with Flaxseed Screenings Oil Feed, or other flaxseed by-products, or both. (Adopted 1943.)

82. Flax Plant By-Product is that portion of the flax plant remaining after the separation of the seed, the bast fibre and a portion of the shives, and consists of flax shives, flax pods, broken and immature flax seeds, and the cortical tissues of the stem. (Adopted 1943.)

MARINE PRODUCTS

83. Fish Meal is clean, dried, ground tissues of undecomposed whole fish or fish cuttings, either or both, with or without the extraction of part of the oil, and contains not more than 3 per cent of salt (NaCl). If it contains more than 3 per cent of salt (NaCl) the amount of salt must constitute a part of the brand name, provided that in no case shall the salt content of this product exceed 7 per cent. (Adopted 1933.)

84. Fish Residue Meal is the clean, dried, undecomposed residue from the manufacture of glue from non-oily fish, and contains not more than 3 per cent of salt (NaCl). If it contains more than 3 per cent of salt (NaCl)

the amount of salt must constitute a part of the brand name, provided that in no case shall the salt content of this product exceed 7 per cent. (Adopted 1933.)

85. Crab Meal is prepared from the undecomposed dried waste of the crab industry and contains the shell, viscera and part or all of the flesh. It contains not less than 25 per cent of protein and not more than 3 per cent of salt (NaCl). If it contains more than 3 per cent of salt (NaCl) the amount of salt must constitute a part of the brand name, provided that in no case shall the salt content of this product exceed 7 per cent. (Adopted 1933.)

86. Shrimp Meal is prepared from the undecomposed dried waste of the shrimp industry and contains the head, hull or the whole shrimp, either or in mixture, and not more than 3 per cent of salt (NaCl). If it contains more than 3 per cent of salt (NaCl) the amount of salt must constitute a part of the brand name, provided that in no case shall the salt content of this product exceed 7 per cent. (Adopted 1933.)

MILK PRODUCTS

87. Dried Buttermilk (Feeding) is the product resulting from the removal of water from clean, sound buttermilk derived from natural cream to which no foreign substances have been added, excepting such as are necessary and permitted in the manufacture of butter. It contains not more than 8 per cent of moisture, not more than 13 per cent of mineral matter (ash), and not less than 5 per cent of butterfat, as determined by the Roese-Gottlieb method. (Adopted 1932.)

88. Evaporated Buttermilk, Concentrated Buttermilk or Condensed Buttermilk is the product resulting from the removal of a considerable portion of water from clean, sound buttermilk derived from natural cream to which no foreign substances have been added excepting such as are permitted and necessary in the manufacture of butter. It contains not less than 27 per cent of total solids, not less than 2 per cent of butterfat, and not more than .14 per cent of ash for each per cent of solids. (Adopted prior to 1928.)

89. Dried Skimmed Milk (Feeding) is the product resulting from the removal of water from clean, sound skimmed milk. It contains not more than 8 per cent of moisture. (Adopted 1930.)

90. Dried Soured Skimmed Milk is the product resulting from the removal of water from clean, sound skimmed milk which has been soured by a suitable culture of lactic bacteria. It contains not more than 8 per cent of moisture. (Adopted 1932.)

91. Evaporated Soured Skimmed Milk, Concentrated Soured Skimmed Milk or Condensed Soured Skimmed Milk is the product resulting from the removal of a considerable portion of water from clean, sound skimmed milk which has been soured by a suitable culture of lactic bacteria. It contains not less than 27 per cent of total solids. (Adopted 1932.)

92. Condensed Skimmed Milk is the product resulting from the removal of a considerable portion of water from clean, sound skimmed milk. It contains not less than 27 per cent of total solids. (Adopted 1930.)

93. Dried Whey is the by-product from the manufacture of cheese or casein, either or both. This product shall contain at least 65 per cent of lactose (milk sugar). (Adopted 1934.)

94. Cheese Rind is cooked, partially defatted cheese rind. (Adopted 1935.)

MINERAL FEEDS

95. Mixed feeds containing both feed and more than 5 per cent of mineral ingredients require, in addition to the usual declaration of the chemical feed analysis, a declaration of each ingredient contained therein and the minimum percentages of calcium (Ca), phosphorus (P), iodine (I), and the maximum percentage of salt (NaCl) if same be present. If minerals predominate in the mixture, the usual declaration of the chemical feed analysis, with the exception of protein, may be omitted.

In mineral feeds for which no nutritional properties other than those of a mineral nature are claimed, the usual chemical guarantees need not be declared. A declaration should be made of each ingredient contained therein and the minimum percentage of calcium (Ca), phosphorus (P), iodine (I), and the maximum percentage of salt (NaCl) if same be present.

The mineral ingredients should be stated in the common English terms, if any such terms exist.

It being impossible to classify separately the drug ingredients and the mineral ingredients, be it resolved:

(a) That all mixtures containing mineral ingredients generally regarded as dietary factors essential for the normal nutrition of animals and which are sold or represented for the primary purpose of supplying these minerals as additions to rations in which these same mineral factors may be deficient, be classified as mineral feeds.

(b) That all other preparations which are sold or represented primarily for the cure, mitigation or prevention of disease be classified by this Association as drugs, medicines or specifics. (Adopted 1935.)

NOTE: The term "defluorinated" shall not be used in connection with the name of any product containing more than one part of fluorine (F) to forty parts of phosphorus (P). (Adopted 1943.)

96. Iodized Salt is common salt (NaCl) containing not less than 0.007 per cent of iodine, uniformly distributed. (Adopted 1942.)

MOLASSES

97. Feeding Cane Molasses is a by-product of the manufacture of cane sugar from cane and shall contain 48 per cent or more of total sugars expressed as invert sugar. Its solution in an equal weight of water shall test not less than 39.75 degrees Brix. (Adopted 1940.)

98. Feeding Beet Molasses is a by-product of the manufacture of beet sugar from sugar beets and shall contain 48 per cent or more of total sugars expressed as invert sugar. Its solution in an equal weight of water shall test not less than 39.75 degrees Brix. (Adopted 1941.)

99. Feeding Corn Sugar Molasses is a by-product of the manufacture of corn sugar from corn and shall contain 48 per cent or more of reducing sugars expressed as dextrose, and shall contain 60 per cent or more of total carbohydrates. Its solution in an equal weight of water shall test not less than 39.00 degrees Brix. (Adopted 1941.)

OAT PRODUCTS

100. Oat Hulls is the product consisting of the outer covering of the oat. (Adopted prior to 1928.)

101. Oat Middlings is the product consisting of the floury portions of the oat groat obtained in the milling of rolled oats. (Adopted prior to 1928.)

102. Oat Shorts is the product consisting of the covering of the oat grain lying immediately inside the hull, being a fuzzy material carrying with it considerable portions of the fine floury part of the groat obtained in the milling of rolled oats. (Adopted prior to 1928.)

103. Oat Chop, Ground Oats, Pulverized Oats, Crushed Oats or Crimped Oats consists of the entire product made by chopping, cutting, grinding, crushing, or crimping whole oats. (Adopted 1931.)

104. Oat Groats are the kernels produced from cleaned and dried oats in the process of manufacturing oat meal. (Adopted 1931.)

105. Hulled Oats, or Undried Oat Groats are the kernels produced from the undried grain in the process of hulling oats. (Adopted 1931.)

106. Feeding Oat Meal is a product obtained in the manufacture of rolled oat groats or rolled oats and consists of broken rolled oat groats, oat groat chips, and floury portions of the oat groats, with only such quantity of finely ground oat hulls as is unavoidable in the usual process of commercial milling. It must not contain more than 4 per cent of crude fibre. (Adopted 1938.)

107. Cut Oat Groats, Cracked Oat Groats, or Ground Oat Groats is the product produced by cutting, cracking, or grinding oat groats. (Adopted 1938.)

108. Clipped Oat By-Product is the by-product obtained in the manufacture of clipped oats. It may contain the light chaffy material broken from the end of the hulls, empty hulls, light immature oats and dust. It must not contain an excessive amount of oat hulls. (Adopted prior to 1928.)

109. Oat Mill Feed (Oat Hulls, Oat Shorts and Oat Middlings) is the entire by-product produced in the manufacture of oat groats and consists of oat hulls, oat shorts and oat middlings. If used in a mixed feed, it shall be called Oat Mill Feed (Oat Hulls, Oat Shorts and Oat Middlings). (Adopted 1932.)

PEANUT PRODUCTS

110. Per Cent Protein Peanut Oil Cake is the product obtained after the extraction of part of the oil by pressure or solvents from peanut kernels as produced under reasonable milling conditions. (Adopted 1941.)

111. Per Cent Protein Peanut Oil Meal is ground peanut oil cake. (Adopted 1941.)

112. Unhulled Peanut Oil Feed is the ground residue obtained after the extraction of part of the oil from whole peanuts, and the ingredients must be designated as "Peanut Meal and Hulls." (Adopted prior to 1928.)

RICE PRODUCTS

113. Rice Bran is the pericarp or bran layer of the rice, with only such quantity of hull fragments as is unavoidable in the regular milling of rice. (Adopted prior to 1928.)

114. Rice Hulls is the product consisting of the outer covering of the rice. (Adopted prior to 1928.)

115. Rice Polishings is a by-product of rice obtained in the milling operation of brushing the grain to polish the kernel. (Adopted 1938.)

116. Rice Meal is ground brown rice or ground rice after the hull has been removed. (Adopted prior to 1928.)

117. Ground Rough Rice is ground rice from which the hull has not been removed or ground paddy rice. (Adopted prior to 1928.)

118. Rice Stone Bran is the sifting from the materials secured in removing hulls from rice and contains rice germs, broken rice and some rice hulls. (Adopted prior to 1928.)

119. Rice Huller Bran is a product secured by the huller and comes from brown rice and consists mostly of the bran and germs. (Adopted prior to 1928.)

RYE PRODUCTS

120. Rye Bran is the coarse outer covering of the rye kernel as separated from the cleaned and scoured rye. (Adopted prior to 1928.)

121. Rye Feed is a by-product obtained in the usual process of the milling of rye flour from cleaned and scoured rye grain, consisting principally of the mill-run of the outer covering of the rye grain and the germs with small quantities of flour and aleurone. (Adopted prior to 1928.)

122. Rye Red Dog is a by-product obtained in the usual process of the milling of rye flour, consisting principally of aleurone with small quantities of flour and fine bran particles and must not contain more than 3.5 per cent of crude fibre. (Adopted prior to 1928.)

123. Rye Low-Grade Feed Flour consists principally of dark rye flour and small quantities of aleurone and fine bran particles and must not contain more than 1.5 per cent of crude fibre. (Adopted prior to 1928.)

124. Rye Middlings consists of rye feed and rye red dog combined in the proportions obtained in the usual process of milling rye flour. (Adopted prior to 1928.)

125. Rye Flour Middlings consists of rye feed, rye red dog and pure dark rye flour combined in the proportion obtained in the milling of rye flour and must not contain more than 5 per cent of crude fibre. (Adopted prior to 1928.)

SCREENINGS

126. Screenings consist of a mixture of mill or elevator run materials or a combination of varying amounts of materials obtained in the process of cleaning grain or seed, either or both, such as inferior, light or broken grain or seed, weed seeds, hulls, chaff, joints, straw, elevator dust, floor sweepings. They must be relatively free of unpalatable or injurious weed seeds, sand and dirt. They must not contain more than 14 per cent of fibre or more than 6.50 per cent of ash. If they bear a name descriptive of their kind or origin, they must correspond thereto. (Adopted 1935.)

127. Screenings—Grain consist of inferior, light or broken grain or seed obtained in the process of cleaning grain or seed or recleaning screen-

ings, either or both. They must be relatively free of weed seeds, chaff, straw, hulls, joints, sand and dirt, and other foreign materials. If they bear a name descriptive of their kind or origin, they must correspond thereto. (Adopted 1935.)

128. Screenings Waste or Screenings Refuse is a mixture of materials or a combination of varying amounts of materials obtained in the process of cleaning grain or seed, either or both, or recleaning screenings, such as weed seeds which may be unpalatable or injurious, chaff, hulls, straw, sticks, joints, elevator dust, floor sweepings, sand and dirt. (Adopted 1935.)

129. Scourings consist of such portions of the cuticle, brush, white caps, dust, smut and other materials as are separated from the grain in the usual commercial process of scouring. (Adopted prior to 1928.)

(NOTE)—If to any of the wheat or rye by-product feeds there should be added screenings or scourings, as above defined, either ground or unground, bolted or unbolted, such brand shall be so registered, labeled and sold as clearly to indicate this fact. The word "Screenings," or "Scourings," as the case may be, shall appear as part of the name or brand and shall be printed in the same size and face of type as the remainder of the brand name. When the word "Screenings" appears it is not necessary to show also on the labeling the word "Scourings." (Adopted prior to 1928.)

The crude fibre standards as shown in the definitions for wheat and rye products apply also if screenings are added. (Adopted 1937.)

SOYBEAN PRODUCTS

130. Ground Soybeans is the product obtained by grinding whole soybeans without cooking or removing any of the oil. (Adopted 1933.)

131. Per Cent Protein Soybean Oil Cake or Per Cent Protein Soybean Oil Chips is the product after the extraction of part of the oil by pressure or solvents from soybeans. If a name descriptive of the process of manufacture, such as expeller, hydraulic, or solvent extracted, be used the product must correspond thereto. (Adopted 1937.)

132. Per Cent Protein Soybean Oil Meal is ground soybean oil cake or ground soybean oil chips. If a name descriptive of the process of manufacture, such as expeller, hydraulic, or solvent extracted, be used the product must correspond thereto. (Adopted 1939.)

VITAMINS

133. Cod Liver Oil is the oil obtained from the livers of gadus morrhuae or other species of the family gadidae, either or both. It must contain not less than 850 U. S. P.¹ units of vitamin A and not less than 85 A. O. A. C.² chick units of vitamin D per gram. (Adopted 1937.)

134. Sardine Oil or Pilchard Oil is the product obtained by extraction of part of the oil from the whole Pacific sardine or pilchard or from cannery refuse of this species of fish. (Adopted 1932.)

135. Salmon Oil is the product obtained by extraction of part of the oil from the cannery refuse of salmon. (Adopted 1932.)

136. Tuna Oil is the product obtained by extraction of part of the oil from the cannery refuse of tuna. (Adopted 1932.)

137. Menhaden Oil is the product obtained by extraction of part of the oil from whole menhaden. (Adopted 1932.)

138. Herring Oil is the product obtained by extraction of part of the oil from the whole herring or part of the herring. (Adopted 1933.)

139. Salmon Liver Oil is the product obtained by extraction of part of the oil from salmon livers. (Adopted 1933.)

140. Stearine is the solid material obtained by filtration from an animal or vegetable oil after chilling or freezing in the process of refining. When this product is sold as a feed, the term shall be prefixed by the name of the oil from which it is obtained. (Adopted 1934.)

141. D Activated Animal Sterol is a product which is obtained by activation of a sterol fraction of animal origin with ultra-violet light or other means. For label identification it may be followed with the parenthetical phrase "(Source of Vitamin D₃)."

 (Adopted 1942.)

¹ United States Pharmacopoeia.

² Association of Official Agricultural Chemists.

WHEAT PRODUCTS

142. Wheat Bran is the coarse outer covering of the wheat kernel as separated from cleaned and scoured wheat in the usual process of commercial milling. (Adopted prior to 1928.)

143. Wheat Standard Middlings consist mostly of fine particles of wheat bran, wheat germ, and very little of the fibrous offal obtained from the "tail of the mill." This product must be obtained in the usual commercial process of milling and must not contain more than 9.5 per cent of crude fibre. (Adopted prior to 1928.)

144. Wheat Flour Middlings shall consist of wheat standard middlings and wheat red dog combined in the proportions obtained in the usual process of milling and must not contain more than 6.0 per cent of crude fibre. (Adopted prior to 1928.)

145. Wheat Red Dog is a by-product obtained in the usual commercial process of flour milling, consisting principally of aleurone with small quantities of wheat flour and fine wheat bran particles and must not contain more than 4.0 per cent of crude fibre. (Adopted prior to 1928.)

146. Wheat Low-Grade Feed Flour is a by-product obtained in the usual commercial process of flour milling, consisting principally of wheat flour with small quantities of aleurone and fine wheat bran particles and must not contain more than 1.5 per cent of crude fibre. (Adopted prior to 1928.)

147. Wheat Bran and Wheat Standard Middlings consist of the two commodities as defined above, mixed in the proportions obtained in the usual process of commercial milling. (Adopted prior to 1928.)

148. Hard Wheat Mixed Feed (mill-run wheat feed) consists of wheat bran and wheat flour middlings combined in the proportions obtained in the usual process of commercial milling. This product must not contain more than 9.5 per cent of crude fibre. (Adopted prior to 1928.)

149. Wheat Brown Shorts (Wheat Red Shorts) consists mostly of the fine particles of wheat bran, wheat germ and very little of the fibrous offal obtained from the "tail of the mill." This product must be obtained in the usual commercial process of milling and must not contain more than 7.5 per cent of crude fibre. (Adopted prior to 1928.)

150. Wheat Gray Shorts (Wheat Gray Middlings or Wheat Total Shorts) consists of the fine particles of the outer bran, the inner bran or

bee-wing bran, the germ and the offal or fibrous material obtained from the "tail of the mill." This product must be obtained in the usual process of commercial milling and must not contain more than 6.0 per cent of crude fibre. (Adopted prior to 1928.)

151. Wheat White Shorts or Wheat White Middlings consists of a small portion of the fine wheat bran particles and the wheat germ and a large portion of the fibrous offal obtained from the "tail of the mill." This product must be obtained in the usual process of flour milling and must not contain more than 3.5 per cent of crude fibre. (Adopted prior to 1928.)

152. Wheat Mixed Feed (mill-run wheat feed) consists of wheat bran and the gray or total shorts combined in the proportions obtained in the usual process of commercial milling. This product must not contain more than 8.5 per cent of crude fibre. (Adopted prior to 1928.)

YEAST

153. Yeast is a product composed of living or dead cells of *saccharomyces cerevisiae* with impurities not exceeding commercial grade; it shall contain at least 45 per cent of protein on the moisture free basis. (Adopted 1938.)

154. Irradiated Yeast is yeast which has been subjected to ultra-violet rays in order to increase its anti-rachitic potency; it shall contain at least 45 per cent of protein on the moisture free basis. (Adopted 1938.)

(NOTE)—If yeast or irradiated yeast consists of bakers' type yeast, the term "bakers' type" shall precede the word yeast; if it consists of brewers' type yeast, the term "brewers' type" shall precede the word yeast.

(NOTE)—When irradiated yeast is used as an ingredient of proprietary feeds for four-footed animals, the name may be followed by a parenthetical phrase "(source of Vitamin D₂)."

MISCELLANEOUS PRODUCTS

155. Dried Apple Pomace is the sound, dried residue obtained by the removal of cider from apples. (Adopted 1929.)

156. Dried Apple Pectin Pulp is the sound, dried residue obtained by the removal of pectin from apple products. (Adopted 1929.)

157. Dried Beet Pulp is the dried residue from sugar beets which have been cleaned and freed from crowns, leaves, and sand, and which have been extracted in the process of manufacturing sugar. (Adopted prior to 1928.)

158. Buckwheat Shorts or Buckwheat Middlings are the portions of the buckwheat grain immediately inside the hull secured after separation from the flour. (Adopted prior to 1928.)

159. Chop is a ground or chopped feed composed of one or more different cereals or by-products thereof. If it bears a name descriptive of the kind of cereals, it must be made exclusively of the entire grains of those cereals. (Adopted prior to 1928.)

160. Dried Citrus Pulp is the peel, pulp, rag, some seed, and occasional cull fruit of citrus fruit which has been ground, filter-pressed, and dried. It may or may not be partially neutralized with lime, the finished product to contain not more than 0.5 per cent calcium (Ca). If it bears a name descriptive of the source it must conform thereto. (Adopted 1939.)

161. Per Cent Protein Coconut Oil Meal or Per Cent Protein Copra Oil Meal is the ground residue from the extraction of part of the oil from the dried meat of the cocoanut. (Adopted prior to 1928.)

162. Processed Garbage is composed of dried animal and vegetable waste from garbage collected sufficiently often that harmful decomposition has not set in, and separated from material such as crockery and glass. Its odor must not be suggestive of the presence of decomposition and it must contain less than one per cent of glass. None of it shall contain knife-like or needle-like particles and the maximum percentage of glass should be stated on the label when present in excess of one-fifth of one per cent. (Adopted prior to 1928.)

163. Ivory Nut Meal is the ground waste material resulting from the manufacture of buttons and similar articles from the vegetable ivory nut. (Adopted prior to 1928.)

164. Palm Kernel Oil Meal is the ground residue from the extraction of part of the oil by pressure or solvents from the kernel of the fruit of *Elaeis guineensis* or *Elaeis melanococca*. (Adopted prior to 1928.)

165. Head Chops is the product consisting of the entire heads of the grain sorghums chopped, and should bear the name of the sorghum from which it is made. This includes, among others, kaffir head chops, milo head chops, feterita head chops, and sorghum head chops. (Adopted prior to 1928.)

166. Head Stems is the product consisting of the stems from the heads of the grain sorghums after the grain has been removed, and should bear the name of the sorghum from which it is made. (Adopted prior to 1928.)

167. Sweet Potato Pulp is the dried residue remaining as a by-product in the process of separation of the starch in its manufacture from sweet potatoes. (Adopted 1943.)

168. Dried Tomato Pomace is a mixture of tomato skins, pulp and crushed seeds resulting from the process of extracting the juice from tomatoes, and dried. (Adopted 1937.)

169. Velvet Bean Meal is ground velvet beans containing only an unavoidable trace of hulls or pods. (Adopted prior to 1928.)

170. Ground Velvet Bean and Pod is the product derived by grinding velvet beans with the pod. It contains no additional pods or other materials. (Adopted prior to 1928.)

171. ADDITIONAL OFFICIALLY RECOGNIZED INGREDIENTS:

RECOGNIZED ENGLISH NAME AND ENGLISH SYNONYM, IF ANY	ARTICLE OR SUBSTANCE IN- DICATED BY THE NAME AND SYNONYM
Capsicum; Red Pepper	The dried, ripe fruit of any species of Capsicum.
Cupric Sulphate; Copper Sulphate	Crystallized copper sulphate with impurities not exceeding commercial grade.
Ferric Oxide; Red Oxide of Iron	Ferric oxide with impurities not exceeding commercial grade.
Ferrous Sulphate	Crystallized ferrous sulphate with impurities not exceeding commercial grade.

RECOGNIZED ENGLISH NAME AND ENGLISH SYNONYM, IF ANY	ARTICLE OR SUBSTANCE IN- DICATED BY THE NAME AND SYNONYM
Dextrose	A refined, crystallized sugar obtained chiefly by the hydrolysis of starch or of a starch-containing substance.
Glucose	A syrup obtained by the incomplete hydrolysis of starch or of a starch-containing substance.
Lactose; Milk Sugar	A sugar obtained from cow's milk.
Magnesium Sulphate; Epsom Salt	Magnesium sulphate with impurities not exceeding commercial grade.
Potassium Bitartrate; Cream of Tartar	Potassium bitartrate with impurities not exceeding commercial grade.
Potassium Nitrate; Saltpeter	Potassium nitrate with impurities not exceeding commercial grade.
Sodium Nitrate; Chile Saltpeter	Sodium nitrate with impurities not exceeding commercial grade.
Sodium Bicarbonate	Sodium bicarbonate with impurities not exceeding commercial grade.
Sodium Chloride; Common Salt	Sodium chloride with impurities not exceeding commercial grade.
Sodium Sulphate; Glauber's Salt	Sodium sulphate with impurities not exceeding commercial grade.
Sulphur	Sulphur with impurities not exceeding commercial grade.
Calcium Phosphate	Tricalcium salt of phosphoric acid with impurities not exceeding commercial grade.
Dicalcium Phosphate	Dicalcium salt of phosphoric acid with impurities not exceeding commercial grade.
Bone Ash	The ash obtained by burning bones with free access of air and containing 15.3-16.6% P.
Precipitated Calcium Carbonate; Precipitated Chalk	Precipitated calcium carbonate with impurities not exceeding commercial grade.
Rock Phosphate	Ground phosphate rock of commercial grade.
Phosphatic Limestone	Ground phosphate-containing limestone of commercial grade.
Limestone; Calcite	Ground calcium limestone of commercial grade.
Dolomitic Limestone; Dolomite	Ground calcium-magnesium limestone of commercial grade.
Shell	Ground shells of oysters or of other mollusks.
Oyster Shell	Ground shells of oysters. (Adopted 1935.)

TENTATIVE DEFINITIONS

These definitions have received favorable consideration, but are not official. They are subject to revision before final adoption.

T-1. Vitamin A & D Feeding Oil is either fish or fish liver oil or a blend of two or more of the following: Vitamin A and/or D concentrate, synthetic vitamin D, fish liver oil, fish oil, marine animal oil, or edible vegetable oil. The vitamin potency shall be stated in A. O. A. C.¹ chick units of vitamin D and U. S. P.² units of vitamin A per gram. (Proposed 1939—Amended 1941.)

(NOTE)—This is an emergency definition and can be used only for the calendar year 1944.

T-2. Vitamin D Feeding Oil is either fish or fish liver oil or a blend of two or more of the following: vitamin D concentrate, synthetic vitamin D, fish liver oil, fish oil, marine animal oil, or edible vegetable oil. The vitamin potency shall be stated in A. O. A. C.¹ chick units of vitamin D per gram. (Proposed 1940—Amended 1941.)

(NOTE)—This is an emergency definition and can be used only for the calendar year 1944.

T-3. Vitamin A Feeding Oil is either fish or fish liver oil or a blend of two or more of the following: vitamin A concentrate, fish liver oil, fish oil, marine animal oil, or edible vegetable oil. The vitamin potency shall be stated in U. S. P.² units of vitamin A per gram. (Proposed 1941.)

(NOTE)—This is an emergency definition and can be used only for the calendar year 1944.

T-4. Fortified Cod Liver Oil is a product consisting of cod liver oil mixed with a small amount of other fish oils or fish oil concentrates or vitamin D, so as to contain not less than 400 A. O. A. C.¹ chick units of vitamin D per gram and shall be labeled with the minimum guarantee in U. S. P. vitamin units of A per gram. If any other oil is so fortified it shall bear a name descriptive of its origin (as Fortified Sardine Oil, Fortified Pilchard Oil, etc.) (Proposed 1937—Amended 1938, 1939, 1940.)

T-5. D Activated Plant Sterol is a product which is obtained by activation of a sterol fraction of plant origin with ultra-violet light or other means. For label identification it may be followed with the parenthetical phrase "(source of Vitamin D₂)." (Proposed 1943.)

T-6. Meat Meal is the ground, dry-rendered residue from animal tissues exclusive of hair, horn, hoof, blood, manure and stomach contents, except in such traces as might occur unavoidably in good factory practice. When this product contains more than 4.4 per cent of phosphorus (P), it must be designated "..... per cent Protein Meat and Bone Meal." If it bears a name descriptive of its kind, composition, or origin, it must correspond thereto. (Proposed 1943.)

T-7. Meat Scrap is the ground, dry-rendered residue from animal tissues exclusive of hair, hoof, horn, blood, manure and stomach contents, except in such traces as might occur unavoidably in good factory practice. When this product contains more than 4.4 per cent of phosphorus (P), it shall be

¹ Association of Official Agricultural Chemists.

² United States Pharmacopoeia.

designated "..... per cent Protein Meat and Bone Scrap." If it bears a name descriptive of its kind, composition, or origin, it must correspond thereto. (Proposed 1943.)

(NOTE)—The designations "Meat Scrap" and "Meat and Bone Scrap" must not be used in connection with food for dogs and fur-bearing animals.

T-8. Digester Tankage, Meat Meal Tankage, or Feeding Tankage is the residue from animal tissues exclusive of hair, hoof, horn, manure, and stomach contents, except in such traces as might occur unavoidably in good factory practice, especially prepared for feeding purposes by tanking under live steam or by dry-rendering, or a mixture of the products; made suitable by drying and grinding. It must not contain more than 4.4 per cent of phosphorus (P). If it bears a name descriptive of its kind, composition, or origin, the material must correspond thereto. (Proposed 1943.)

T-9. Digester Tankage with Bone, Meat and Bone Meal Digester Tankage, Meat and Bone Meal Tankage, or Feeding Tankage with Bone is the residue from animal tissues exclusive of hair, hoof, horn, manure, and stomach contents, except in such traces as might occur unavoidably in good factory practice, especially prepared for feeding purposes by tanking under live steam or by dry-rendering, or a mixture of the products; made suitable by drying and grinding, and containing more than 4.4 per cent of phosphorus (P). If it bears a name descriptive of its kind, composition, or origin, it must correspond thereto. (Proposed 1943.)

T-10. Extracted Animal Liver Meal is the product obtained by drying and grinding the residue of animal liver tissue from which a large portion of the vitamins and/or minerals have been removed. (Proposed 1943.)

T-11. Condensed Fish Press Water is the product obtained by condensing the water resulting from the hydraulic extraction of oil from fish. (Suggested 1943.) (Proposed 1943.)

T-12. Fish Liver and Glandular Meal is the product obtained by drying the complete coelomic contents of the fish. At least 50 per cent of the dry weight of the product must be derived from fish liver and the product must contain at least 40 micrograms per gram of riboflavin. (Suggested 1942.) (Proposed 1943.)

T-13. Dried Milk By-Product is a designation which may be used in the list of ingredients of a mixed feed to indicate the presence of dried skimmed milk, dried buttermilk, or dried whey, or a blend of two or more of these products. (Proposed 1941.)

(NOTE)—This is an emergency definition and can be used only for the calendar year 1944.

T-14. Condensed Whey is the product resulting from the removal of a considerable portion of water from clean, sound cheese or casein whey, either or both. It must not contain less than 62 per cent of total whey solids. When this product contains less than 62 per cent of total whey solids, it shall be designated "condensed whey, ... per cent solids." (Proposed 1943.)

T-15. Condensed Whey Solubles is the product resulting from the removal of albumen and the partial removal of milk sugar from clean, sound whey, to which no foreign substances have been added except such as are necessary in the manufacture of milk sugar. (Proposed 1941.)

T-16. Dried Whey Solubles is the product resulting from the removal of albumen and the partial removal of milk sugar from clean, sound whey, to which no foreign substances have been added except such as are necessary in the manufacture of milk sugar. (Proposed 1941.)

T-17. Casein (Feeding) is the product resulting from acid or rennet precipitation of skimmed milk. It must contain at least 80 per cent of crude protein. (Proposed 1943.)

T-18. The fluorine content of any minerals or mineral mixtures which are to be used directly for the feeding of domestic animals shall not exceed 0.30 per cent for cattle; 0.35 per cent for sheep; 0.45 per cent for swine, and 0.60 per cent for poultry.

Rock phosphate or other fluorine bearing ingredients may be used only in such limited amounts in feeding stuffs so that they will not raise the fluorine of the total concentration of the (grain) ration above the following amounts: for cattle 0.009 per cent of fluorine; for sheep 0.010 per cent of fluorine; for swine 0.014 per cent of fluorine; and for poultry 0.035 per cent of fluorine. (Suggested 1938.) (Proposed 1943.)

T-19. Defluorinated Phosphate includes either calcined, fused or precipitated calcium phosphate which contains not more than one part of fluorine (F) to forty parts of phosphorus (P). The minimum percentage of calcium (Ca) and phosphorus (P) and the maximum percentage of fluorine (F) shall be stated on the label. (Proposed 1943.)

(NOTE)—This is an emergency definition and can be used only for the calendar year 1944.

T-20. Buckwheat Middlings is that portion of the buckwheat grain immediately under the hull after separation of the flour. It shall contain no more hulls than is obtained in the usual process of buckwheat milling, and must not contain more than 10 per cent of crude fibre. (Proposed 1943.)

T-21. Buckwheat Feed is a mixture of buckwheat middlings and buckwheat hulls. It must not contain more than 30 per cent of crude fibre. (Proposed 1943.)

T-22. Flaked Corn is the product obtained by running cracked corn which has been aspirated and properly tempered, over smooth flaking rolls and subsequently dried and cooled. (Proposed 1941.)

T-23. Ear Corn Chops with Husks is corn, cob, and husks chopped with no greater proportion of cob and husks than occurs in the ear corn in its natural state. (Proposed 1943.)

T-24. Ground Peanut Vine Hay is the ground product obtained after the separation of peanuts from peanut vines and contains all or a large portion of the leaves and vines. (Proposed 1941.)

T-25. Ground Peanut Vine Stem Hay is the ground product obtained after the separation of peanuts from peanut vines from which practically all of the leaves have been removed and only vines and stems remain. (Proposed 1941.)

T-26. Peanut Feed is a mixture of peanut oil meal and peanut hulls. It must be designated and sold according to its protein content. (Proposed 1943.)

T-27. Ground Peanut Skins and Hull is a product consisting of peanut skins with only sufficient hulls added to accomplish grinding of the mixture. It must contain not less than 11 per cent of crude fat and not more than 25 per cent of crude fibre. (Proposed 1943.)

T-28. Soybean Mill Feed is the by-product resulting from the manufacture of soybean flour or grits and is composed of soybean hulls and the offal from the tail of the mill. (Proposed 1943.)

T-29. Soybean Hay Meal is the product obtained from the grinding of the entire soybean hay, without the addition of any stems, straw or foreign

material, or the abstraction of leaves. It must be reasonably free from other crop plants and weeds and must not contain more than 33 per cent of crude fibre. (Proposed 1943.)

(NOTE)—The word "dehydrated" may precede the above definition, provided the hay has been artificially dried.

T-30. Wheat Distillers' Dried Grains is the dried residue obtained in the manufacture of alcohol and distilled liquors from wheat, or from a grain mixture in which wheat predominates. (Proposed 1943.)

T-31. Wheat Distillers' Dried Grains with Solubles is the dried residue obtained in the manufacture of alcohol and distilled liquors from wheat, or from a grain mixture in which wheat predominates, and contains the major portion of the condensed screened stillage dried therewith. (Proposed 1943.)

T-32. Semi-Solid Wheat Distillers' Solubles is the product obtained in the manufacture of alcohol and distilled liquors from wheat, or from a grain mixture in which wheat predominates, by condensing to a syrupy consistency the entire stillage contained therein. (Proposed 1943.)

T-33. Dried Wheat Distillers' Solubles is the product obtained by drying Semi-Solid Wheat Distillers' Solubles. (Proposed 1943.)

T-34. Commercial Wheat Germ Meal is a commercial product obtained in the grinding of wheat, composed chiefly of wheat germs together with some bran and middlings or shorts and shall contain not less than 25 per cent of protein and 9 per cent of fat. (Proposed 1941.)

T-35. Wheat Germ Oil Cake is the cake secured in the removal of part of the oil from commercial wheat germs and shall contain not less than 29 per cent of protein. (Proposed 1941.)

T-36. Wheat Germ Oil Meal is ground wheat germ oil cake. (Proposed 1941.)

(NOTE)—If any wheat or wheat by-product feeds shall be wholly or partly degermed, such products shall be registered, labeled, and sold as to clearly indicate this fact.

T-37. Yeast is the cells of an organism of the botanical classification "*saccharomyces cerevisiae*." (Proposed 1942.)

T-38. Irradiated Yeast, Irradiated Yeast is yeast which has been subjected to ultra-violet rays in order to increase its anti-rachitic potency. (Proposed 1943.)

T-39. Brewers' Dried Yeast is the properly dried yeast filtered from beer after fermentation and shall contain not less than 45 per cent of protein on the moisture free basis. (Proposed 1943.)

T-40. Grain Distillers' Dried Yeast is the properly dried yeast resulting from the fermentation of grains and yeast, separated from the mash, either before or after distillation. (Proposed 1943.)

T-41. Molasses Distillers' Dried Yeast is the properly dried yeast resulting from the fermentation of molasses and yeast, separated from the medium, either before or after distillation. (Proposed 1943.)

T-42. Yeast Culture is the product composed of yeast in a base of cereal meals and capable of producing active fermentation. The ingredients shall be stated on the registration and label. (Proposed 1943.)

T-43. Dried Spent Hops is the product obtained by drying the material filtered from hopped wort. (Proposed 1943.)

T-44. Recleaned Malt Sprouts is the product obtained after the removal of most of the malt hulls from malt sprouts, or the malt sprouts obtained by the first cleaning of malted barley produced in the drum method

of malting. It shall contain not more than 2 per cent of malt hulls and not less than 28 per cent of protein. (Proposed 1941.)

T-45. Milo Bran is the outer covering of the milo kernel secured in milling milo for brewers grits or other similar purposes. A similar product made from other grain sorghums shall bear the name of the grain from which it is made. (Proposed 1943.)

T-46. Per Cent Protein Babassu Oil Meal is the ground residue obtained after the extraction of part of the oil from babassu kernels (*or-bignya speciosa*) by crushing, cooking and mechanical pressure. (Proposed 1943.)

T-47. Per Cent Protein Sesame Oil Meal is the ground residue obtained after the extraction of part of the oil by pressure from sesame seed as produced under reasonable milling conditions. (Proposed 1943.)

T-48. Mineral Feeds—(NOTE)—When the word "Iodized" is used in connection with a feed ingredient, the ingredient shall contain not less than 0.007 per cent of iodine uniformly distributed. (Proposed 1942.)

THE FOLLOWING DEFINITIONS HAVE BEEN PROPOSED FOR FUTURE DISCUSSION

F-1. Per Cent Protein Palm Nut Oil Meal is the ground residue from the extraction of part of the oil from one or more species of palm nut. If a specie name is used, the product must correspond thereto. (Suggested 1938.)

F-2. Sardine Oil or Pilchard Oil is the product obtained by extraction of part of the oil from the whole Pacific sardine or pilchard or from cannery refuse of this species of fish. It must contain not less than 85 A. O. A. C. chick units of vitamin D per gram. (Suggested 1941.)

F-3. Riboflavin Supplement is a feeding material used solely for its riboflavin content and shall contain not less than 40 parts per million of riboflavin according to the tentative method of the Association of Official Agricultural Chemists. The label shall bear a statement of origin. (Suggested 1941.)

F-4. Dried Fermentation Solubles is the product from the concentration and dehydration of the liquid resulting from the action of the ferment on the basic medium of grain or molasses, and shall contain not less than 40 micrograms per gram of riboflavin. (Suggested 1943.)

F-5. Superphosphate, Dicalcium Phosphate, Partially Defluorinated Phosphate, Soft Phosphate with Colloidal Clay, and other Phosphate Materials, when sold for feeding purposes, must be suitable for feeding. The minimum percentages of calcium (Ca) and phosphorus (P) and the maximum percentage of fluorine (F) must be stated on the label. (Suggested 1943.)

LAW GOVERNING QUALITY, PURITY, AND REGISTRATION OF COMMERCIAL FEEDING STUFFS

Submitted by Mr. A. M. G. Socke, Chief.

Division of Inspection

Augusta, Maine

CHAPTER 41. REVISED STATUTES

PROTECTION AGAINST ADULTERATED OR MISBRANDED GOODS

Sec. 1. *Sale of certain adulterated goods is prohibited.* No person shall, within this State, manufacture, sell, distribute, transport, offer to expose for sale, distribute, or transportation, any article of commercial feeding stuff which is adulterated or misbranded within the meaning of this chapter.

Sec. 2. *Definition.* The term "commercial feeding stuff" as used herein shall be held to include all articles which are used for feeding live stock, and poultry, except hay and straw, the whole seeds, and the minutest meals made directly from the whole grains of wheat, rye, barley, oats, Indian corn, buckwheat, flaxseed and linseed meal.

Sec. 3. *Markings on packages of commercial feeding stuff.* Every lot or package of commercial feeding stuff within a manufacturer, sold, distributed, transported, offered to expose for sale, distribution or transportation in the State of any person, shall have affixed to a conspicuous place on the outside thereof, a plainly printed statement, clearly and truly giving the number of net pounds in the package; the name, brand or trade mark under which the article is sold; the name and principal address of the manufacturer or shipper; a chemical analysis stating the minimum percentage of crude fiber, the minimum percentage of crude fat, and the minimum percentage of crude protein, allowing one per cent. of nitrogen to equal six and one-fourth per cent. of protein, which it contains; all direct constituents to be determined by the methods adopted by the Association of Official Agricultural Chemists; if the feeding stuff is a compound feed, the name of each ingredient contained therein; and if artificially colored, the name of the material used for that purpose. If the feeding stuff is sold in bulk or put up in packages belonging to the purchaser, the seller shall upon the request of the purchaser furnish him with a copy of the statements named in this section.

Sec. 4. *Label and marking on commercial feeding stuff registered corporations.* No day concern with such manufacturer, sell, distribute, transport, offer to expose for sale, distribution or transportation, in the State, any commercial feeding stuff shall, before so doing, file with the commissioner of agriculture for each and every commercial feeding stuff bearing a distinguishing name or trademark, a certified copy of the statements required by section three. Said certified copy shall be accompanied when any commissioner shall so request, with a sample package containing not less than one

pound of the commercial feeding stuff. The person who shall file said certificate shall pay annually to the commissioner of agriculture a registration fee of ten dollars, this fee to be assessed on any brand offered for sale, distribution or transportation in the state; provided, however, that a brand of commercial feeding stuff may be registered for the following year without the payment of the fee upon the establishment by the person who paid said fee that the total sales within the state during the year of which said fee was paid did not exceed fifty tons. Whenever any person shall have filed such certificate and paid such registration fee, no other person shall be required to file such statement or pay such fee.

Sec. 17. *Registration may be refused when name or trademark is misleading.* The commissioner of agriculture may refuse to register any commercial feeding stuff, bearing a name, brand or trademark which is misleading or deceptive or which would tend to mislead or deceive as to materials of which it is composed, and in the case of commercial feeding stuff when the specific names of each and all of the ingredients used in its manufacture are not stated. He may also cancel the registration of any feeding stuff that he deems to be manufactured, sold, distributed, transported, offered or exposed for sale, distribution or transportation in violation of any of the provisions of this chapter. The registration of each brand of commercial feeding stuff shall terminate on the thirty-first day of December of each year.

Sec. 18. *When goods shall be deemed to be adulterated.* For the purpose of this chapter an article shall be deemed to be adulterated:

In case of *commercial feeding stuffs*:

First. If its weight, composition, quality, strength or purity do not conform in each particular to the claims made upon the affixed guaranty.

Second. If it be colored, coated, or stained in a manner whereby damage or inferiority is concealed.

Third. If it contains any poisonous or deleterious ingredients which may render such article injurious to the health of live stock or poultry.

Fourth. If any milling or manufactured offals or any foreign substance whatever have been added to any whole or ground grain or other commercial feeding stuff, unless the true composition, mixture or adulteration is plainly marked or indicated upon the container thereof.

Sec. 19. *Term "misbranded" defined.* The term "misbranded" as used herein, shall apply to all articles of commercial feeding stuff, the package or label of which shall bear any statement, design, or device regarding such article or the ingredients or substances contained therein which shall be false or misleading in any particular or which is falsely branded in any particular.

For the purpose of this chapter an article shall also be deemed to be misbranded:

In case of *commercial feeding stuff*:

First. If any package fails to bear all of the statements required by section nine.

Second. If the printed statements required by section nine to be affixed to the package differ from the statements required by section ten.

Third. If any brand is manufactured, transported, distributed, sold,

offered or exposed for sale, distribution, or transportation upon which the registration fee required by section ten has not been paid.

Sec. 30. *Annual analysis; results of analyses to be published.* The director of the Maine Agricultural Experiment Station shall annually analyze or cause to be analyzed, samples of articles of commercial feeding stuff, at such time and to such extent as the commissioner of agriculture may determine. And said commissioner, in person or by deputy, shall have free access, ingress and egress at all reasonable hours to any place or any building wherein articles of commercial feeding stuff are manufactured, stored, transported, sold, offered or exposed for sale. He may also, in person or by deputy, open any case, package or other container, and may, upon tendering the market price, take samples for analysis. The results of all analyses of articles of commercial feeding stuff made by said director shall be published by him in the bulletins or reports of the experiment station, together with the names of the persons from whom the samples were obtained, the names of the manufacturers thereof and such additional information as to him may seem advisable.

Sec. 35. *Certificates signed by director, presumptive evidence.* Every certificate duly signed and acknowledged by the director of the Maine Agricultural Experiment Station, relating to the collection and analysis of any sample of commercial feeding stuff shall be presumptive evidence of the facts therein stated.

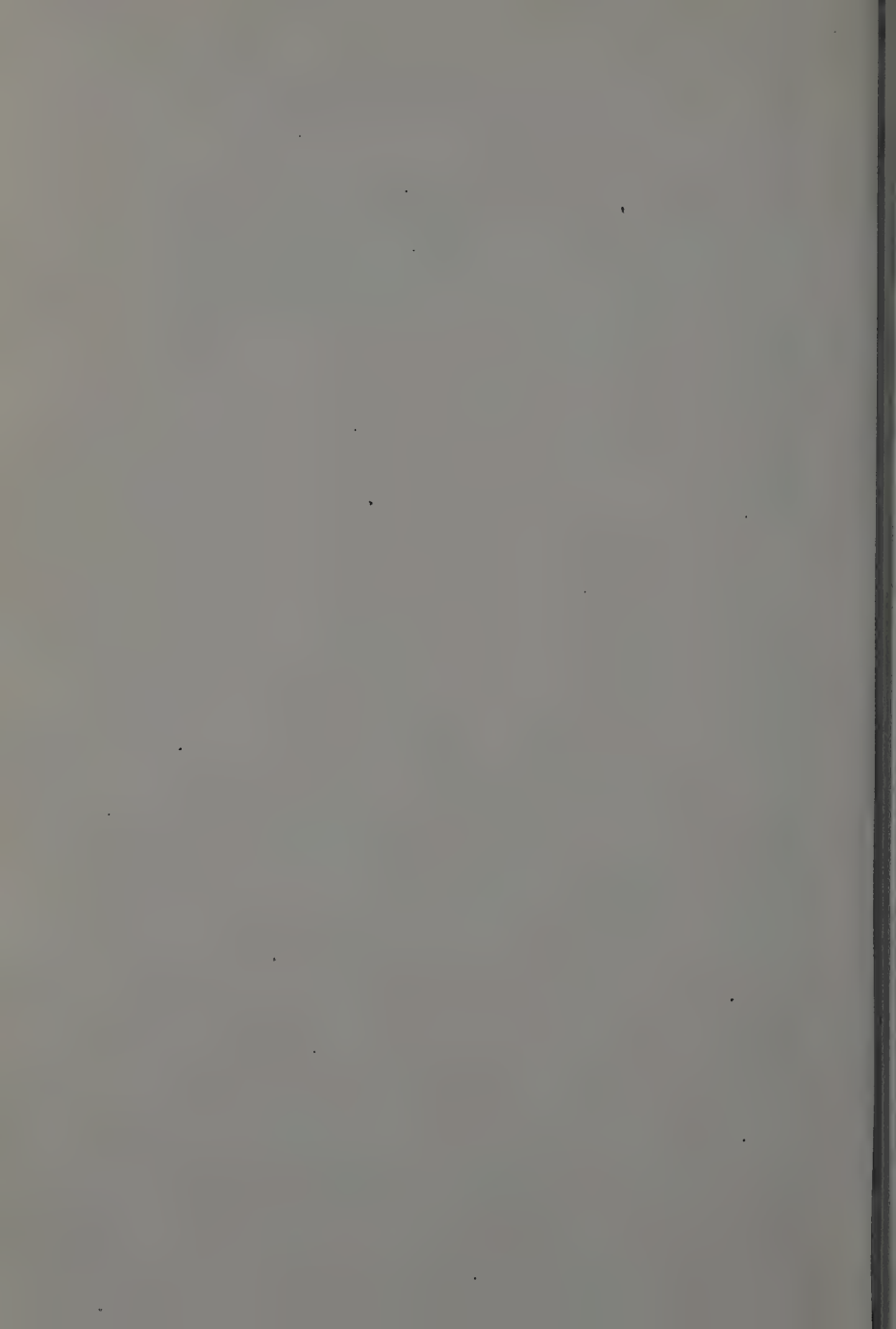
Sec. 36. *Adulteration or misbranding prohibited.* No person shall adulterate or misbrand, within the meaning of this chapter, any commercial feeding stuff, or manufacture, sell, distribute, transport, offer or expose for sale, distribution, or transportation, any article of commercial feeding stuff, in violation of any of the provisions of this chapter. Whoever violates said provisions shall be punished by a fine of not more than one hundred dollars for the first offense, and by a fine of not more than two hundred dollars for each subsequent offense.

Sec. 37. *Exemption from prosecution.* No person shall be prosecuted under the provisions of the preceding sections of this chapter when he can establish proof of purchase, and a guaranty signed by the person residing in the United States, from whom the purchase was made, to the effect that the article in question is not adulterated or misbranded within the meaning hereof.

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October, 1944

MAINE
AGRICULTURAL EXPERIMENT STATION
ORONO, MAINE

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Official Inspections

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COMMERCIAL FERTILIZERS, 1944

ELMER R. TOBEY

The Commissioner of Agriculture is the executive of the law regulating the sale of fertilizers in Maine. It is the duty of the Director of the Maine Agricultural Experiment Station to make or to cause to have made, the analyses of the samples collected by the Commissioner, and to publish the results of the analyses together with such additional information as may seem advisable.

NOTE: All correspondence relative to the inspection laws and requests for copies of the laws should be addressed to the Division of Inspection, Department of Agriculture, Augusta, Maine.

* On leave of absence. Military service.

INSPECTION OF FERTILIZER

In this bulletin are given the results of the analyses of the samples of fertilizers collected and submitted during the year 1944 to the Maine Agricultural Experiment Station by the Division of Inspection, Department of Agriculture, Augusta, Maine. Credit for the analyses is due to each member of the Department of Chemistry; for the compilation of the results of analyses to Rose H. McGuigan, Stenographer. Two hundred four samples of fertilizer materials were collected and analyzed. One hundred fifty five of these samples are mixed fertilizers containing nitrogen, phosphoric acid, potash, and in some of the samples, magnesium. The samples of mixed fertilizers represent one hundred fifteen different brands. A summary indicating the type of materials collected and analyzed is given below.

Type of Material	No. of samples	Analyses on page
Ammonium Nitrate (Nitraprills).....	2	69
Ground Bone.....	7	66
Liming Materials.....	10	68
Manure.....	15	65
Milorganite.....	1	69
Mixed Fertilizers.....	155	50
Muriate of Potash.....	2	69
Nitrate of Soda.....	2	69
Sulphate of Ammonia.....	1	69
Sulphate of Potash-Magnesium (Sul-Po-Mag).....	1	69
Superphosphate.....	7	67
Uramon.....	1	69
Total.....	204	

In the tables which follow are given the name and address of the manufacturer, the brand, the town where the sample was taken, the manufacturers' guaranties, and the results of the analyses. In Table 1 a column is included in which is recorded the percentage of nitrogen present as organic. This percentage of nitrogen as organic is not determined directly by analysis. It is obtained by subtracting the sum of the nitrate nitrogen and the ammonia nitrogen from the total. The nitrogen present as nitrate or ammonia salts is an inorganic or mineral form of nitrogen which is soluble in water. The nitrogen present as organic may or may not be completely soluble in water. Quantitative determinations of magnesium were made on all samples which were guaranteed to contain this element. The results of these analyses are expressed as magnesium oxide.

TABLE 1
Analyses of Samples of Mixed Fertilizers

Station number	Name and Address of Manufacturer, Brand, and Town Where Sampled	NITROGEN			PHOSPHORIC ACID		POTASH		MAGNESIUM OXIDE	
		As ammonia %	As nitrate %	As organic %	Total %	Avail-able %	Water soluble %	Total %	Water soluble %	Total %
15236	AGRICULTURAL LABORATORIES, INC., COLUMBUS, O. Stim-U-Plant Waterville Ellsworth	*G 3.86	9.33	0.75	11.00	12.00	15.00			
15237		*F G 0.15		4.24	13.94 4.00 4.39	12.74 12.00 9.94	30.46 8.00 10.05			
15199		G F 3.91	0.53	0.45	5.00 4.89	7.00 7.56	10.00 10.08	1.00 1.32	0.76	
15063	AMERICAN AGRICULTURAL CHEMICAL CO., NORTH WEYMOUTH, MASS. Houlton AA Quality Fertilizer 5-8-7 Portland Houlton	G F 4.07	0.80	0.38	5.00 5.25	8.00 7.70	7.00 7.52	1.00 1.58	1.05	
15191		G F 5.23	0.43	0.60	6.00 6.25	9.00 9.03	12.00 12.44	2.00 2.72	2.37	
15079		G F 5.10	0.64	0.23	6.00 5.97	9.00 8.10	12.00 12.02	2.50 2.37	2.00	
15068	AGRICULTURAL LABORATORIES, INC., COLUMBUS, O. Houlton Presque Isle Houlton	F G 5.12	0.69	0.36	6.17 6.00	9.11 9.00	12.35 12.00	2.84 2.50	2.37	
15214		F G 5.18	0.48	0.60	6.26 6.00	9.15 9.00	12.00 11.90	2.63 2.50	2.37	
15087		F G 5.07	0.50	0.44	6.01 6.00	9.00 9.00	15.70 15.70	2.50 2.37	2.00	
15064	AGRICULTURAL LABORATORIES, INC., COLUMBUS, O. Houlton Presque Isle Houlton	G F 2.10	0.67	0.23	3.00 3.00	12.00 11.96	6.00 5.82	1.00 1.32	0.76	
15093		G F 3.81	0.87	0.43	5.00 5.14	10.00 10.06	5.00 5.37	1.00 1.32	0.76	
15232		F G 3.99	0.40	0.84	5.23 5.23	10.10 10.10	5.36 5.36	1.00 1.32	0.76	

* These letters indicate guaranteed and found, respectively.

Analyses of Samples of Mixed Fertilizers

Station number	Name and Address of Manufacturer, Brand, and Town Where Sampled	NITROGEN			PHOSPHORIC ACID		POTASH	MAGNESIUM OXIDE	
		As ammonia %	As nitrate %	As organic %	Total %	Avail-able %	Total %	Water soluble %	Total %
15067	Agrico for Lawns, Trees, and Shrubs 6-10-4 Portland	*G *F 5.29	0.75	0.34	6.00 6.38	10.00 10.22	11.43	4.00 4.80	
15061	Agrico for New England 5-8-7 Portland	G 3.80 F 3.97	0.62 0.65	0.51 0.39	5.00 5.01	8.00 9.81	9.26 10.87	1.00 1.12 -0.79	1.50 1.52 1.53
15231	Kezar Falls								
15165	Agrico for Potatoes 5-7-10 Presque Isle	G 4.37 F	0.39	0.62	5.00 5.38	7.00 7.72	7.00 8.08	10.00 10.86	1.50 2.13
15062	Agrico for Potatoes 5-10-10 Portland	G 3.87 F 4.14	0.78 0.81	0.36 0.30	5.00 5.25	10.00 10.60	11.54 10.92	10.00 10.00 10.74	1.50 1.87 1.78
15189	Fryeburg Center								
15066	Agrico for Top Dressing 7-7-7 Portland	G 6.08 F	0.70	0.36	7.00 7.14	7.00 7.61	8.43	7.00 7.14	
	AMERICAN LIQUID FERTILIZER CO., INC., MARIETTA, O.								
15239	Liqua-Vita Brunswick	G 1.82 F	1.83	0.95	6.00 4.60	9.00 9.93	9.93	7.00 7.10	
	ARMOUR FERTILIZER WORKS, CARTARET, N. J., AND SEARSPORT, ME.								
15180	Armour's Big Crop Fertilizer 3-12-6 Searsport	G 2.36 F	0.55	0.18	3.00 3.09	12.00 12.23	12.77	6.00 6.28	
15154	Armour's Big Crop Fertilizer 5-7-10 Searsport	G 4.30 F	0.65	0.33	5.00 5.00	7.00 7.05	7.36 7.00	10.00 10.00	2.11 1.00
15169	Caribou	G 3.97 F	0.68	0.26	4.91	7.39	7.75	9.96	1.80

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Station number	Name and Address of Manufacturer, Brand, and Town Where Sampled	NITROGEN			PHOSPHORIC ACID		POTASH	MAGNESIUM OXIDE	
		As ammonia %	As nitrate %	As organic %	Total %	Avail-able %	Total %	Water soluble %	Total %
15148	Armour's Big Crop Fertilizer 5-8-7	G			5.00	8.00	7.00	1.00	1.88
15172	Searport Limestone	F	0.64	0.23	5.01	7.99	7.35	1.23	1.00
15149	Armour's Big Crop Fertilizer 5-10-5	F	0.51	0.25	5.18	8.16	7.00	0.90	1.75
	Searport	F	0.40	0.23	5.07	10.04	5.00		
15155	Armour's Big Crop Fertilizer 5-10-10	G			5.00	10.00	10.00	1.00	2.22
	Searport	F	0.43	0.32	5.23	9.93	10.84	1.05	
15091	Armour's Big Crop Fertilizer 6-9-15	G			6.00	9.00	15.00	1.50	1.62
15202	Presque Isle East Newport	F	0.81	0.02	6.11	9.38	13.92	1.36	1.44
		F	0.85	0.85	5.97	9.34	15.08		
15092	Armour's Big Crop Fertilizer 8-12-16	G			8.00	12.00	12.00	2.00	2.14
	Presque Isle	F	0.43	0.52	8.04	11.78	17.02	1.74	
15151	Armour's Victory Garden Fertilizer 5-10-5	G			5.00	10.00	5.00		
15170	Searport Caribou	F	0.53	0.33	5.14	10.97	11.24	5.88	
		F	0.55	0.34	5.07	10.00	10.00	5.00	
		F				10.74	11.01	5.40	
15084	AROOSTOOK FEDERATION OF FARMERS, CARIBOU, ME. Federation High Organic 5-7-10	G			5.00	7.00	10.00	1.00	1.41
	Caribou	F	0.57	0.27	4.85	7.40	10.78	1.07	
15083	Federation 6-9-12	G			6.00	9.00	12.00	1.50	1.50
15198	Caribou Sherman Station	F	0.61	0.20	6.26	9.09	12.44	1.08	1.50
15082	Federation 8-12-16	G			8.00	12.00	12.00	2.00	1.92
	Caribou	F	0.29	0.87	7.13	8.65	11.77	0.69	2.00
		F	0.41	0.20	8.00	12.00	16.00	0.38	1.63
		F			8.24	12.07	16.90		

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Station number	Name and Address of Manufacturer, Brand, and Town Where Sampled	NITROGEN			PHOSPHORIC ACID		POTASH		MAGNESIUM OXIDE	
		As ammonia %	As nitrate %	As organic %	Total %	Avail-able %	Total %	Water soluble %	Water soluble %	Total %
15248	Federation Victory Garden Fertilizer 3-3-7 Caribou									
		*G 2.42	0.33	0.27	3.00	8.00	8.00	7.00		
		*F			3.02	8.62	8.93	8.11		
15036	AROOSTOOK HI-TEST FERTILIZER CO., PRESQUE ISLE, ME. Hi-Test Brand 7-14-14 Presque Isle	G 4.39	0.82	2.67	7.00	14.00	14.52	14.00	2.38	2.00
		F			7.83	14.35		15.08		2.45
15094	Hi-Test Brand 8-12-16 Presque Isle	G 4.50	1.43	2.44	8.00	12.00	13.15	16.00		2.00
		F			8.37	13.04	12.00	18.01	1.30	1.54
15212	Caribou	G 5.57	1.41	1.39	8.00	12.00	12.99	16.00		2.00
		F			8.37	12.82	12.99	17.90	1.07	1.81
15095	Hi-Test Brand 8-10-16 Presque Isle	G 4.78	1.50	2.29	8.00	16.00	16.10	16.00		
		F			8.57	15.99		17.43		
15077	CALLINAN BROS., HOULTON, ME. Callinan Bros. XXXX Brand 6-9-12-1½ Houlton	G 4.46	1.62		6.00	9.00	9.00	12.00	1.50	2.69
		F			6.08	9.24	9.32	12.44	1.88	
15076	Callinan Bros. XXXX Brand 6-9-15-1½ Houlton	G 4.27	1.52		6.00	9.00	9.00	15.00	1.50	2.30
		F			5.79	9.20	9.26	15.28	2.08	
15075	CANADA PACKERS, LIMITED, ST. JOHN, N. B. Shur Gain Fertilizer 5-7-10-1 Houlton	G 3.94	0.66	0.40	5.00	7.00	7.68	10.00	1.00	1.61
		F			5.00	7.37	7.00	9.93	1.48	1.05
15210	Caribou	G 3.82	0.70	0.53	5.05	7.41	7.56	10.00	1.59	1.64
		F			5.00	8.00	7.00	9.71	1.00	
15098	Shur Gain Fertilizer 5-8-7-1 Easton	G 3.97	0.90	0.14	5.01	8.50	8.64	7.48	1.59	1.95
		F								

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Analyses of Samples of Mixed Fertilizers

Station Number	Name and Address of Manufacturer, Brand, and Town Where Sampled	NITROGEN				PHOSPHORIC ACID		POTASH		MAGNESIUM OXIDE	
		As ammonia %	As nitrate %	As organic %	Total %	Avail. %	Total %	Water soluble %	Water soluble %	Water soluble %	Total %
15037	Shur Gain Fertilizer 5-10-10-1 Easton	*G 3.56	0.71	0.53	5.00	10.00	10.44	10.00	1.00	1.00	1.63
15080	Shur Gain Fertilizer 6-9-15-1½ Houlton	G 4.00	0.95	0.71	6.00	10.27	9.18	10.74	1.46	1.50	2.85
15173	CANADIAN INDUSTRIES, LIMITED, HALIFAX, N. S. C. I. L. 5-7-10 Fort Kent	G 3.67	0.72	0.64	5.00	9.00	7.00	15.00	1.50	1.41	1.00
15107	COLBATH & ANDERSON FERTILIZER CO., MARS HILL, ME. C & A Brand 6-9-12 Mars Hill	G 4.07	1.11	1.29	5.03	8.57	8.93	9.22	1.00	1.07	4.63
15112	CONSOLIDATED RENDERING CO., BOSTON, MASS. Corenco 3-12-6 Animal Brand	G 2.64	0.79	0.17	6.00	9.00	9.00	12.00	1.00	1.00	1.00
15227	Skowhegan North Berwick	F 2.51	0.70	0.35	6.47	8.29	8.51	12.52	1.07	1.82	1.82
15103	Corenco 5-7-10 With Water Soluble Magnesium Van Buren	G 4.21	0.70	0.23	5.00	7.00	7.56	10.00	1.23	1.00	1.00
15230	Waterboro	G 4.27	0.42	0.58	5.14	6.99	7.00	10.32	1.23	2.51	2.51
15125	Corenco 5-8-7 Potato and General Crop Livermore	G 4.14	1.04	0.45	5.00	7.00	7.87	10.00	1.23	1.00	1.00
15228	Berwick	F 4.14	0.79	0.45	5.18	8.34	8.42	7.82	1.23	1.00	1.00

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Station number	Name and Address of Manufacturer, Brand, and Town Where Sampled	NITROGEN				PHOSPHORIC ACID		POTASH	MAGNESIUM OXIDE	
		As ammonia %	As nitrate %	As organic %	Total %	Avail. %	Total %	Water soluble %	Water soluble %	Total %
15142	Corenco 5-10-5 Victory Garden Fertilizer Belfast	*G *F 2.74		2.26	5.00 5.00	10.00 10.19	10.50	5.00 5.98		
15229	Corenco 5-10-10 Peerless Potato	G 4.12	0.83	0.32	5.00	10.00		10.00		
15250	Berwick Caribou	G 4.18	0.71	0.21	5.00	10.00	11.37	10.74		
15101	Corenco 6-9-15 With Water Soluble Magnesium Caribou	G 4.87	0.90	0.49	6.00 6.23	10.17 9.44	10.78	10.54		1.50 2.62
15141	Corenco 7-7-7 Complete Fruit and Top Dressing Belfast	G 6.06	0.65	0.41	7.00 7.12	7.00 7.29	7.57	7.00 7.64		
15057	EASTERN STATES FARMERS' EXCHANGE, WEST SPRINGFIELD, MASS. Eastern States 5-10-5 Victory Garden Brewer	G 4.05	1.05	0.15	5.00 5.25	10.00 10.24	10.58	5.00 5.32	1.53	2.00 3.55
15056	Eastern States 5-10-10 Brewer	G 4.12	1.20		5.00 5.32	10.00 10.39	10.84	10.00 10.24	0.34	2.00 2.52
15126	Eastern States 5-17-0 Auburn	G 3.67	1.34	0.11	5.00 5.12	17.00 17.90	19.46	0.00		
15183	Eastern States 8-8-8 Auburn	G 6.17	1.60	0.18	8.00 7.95	8.00 8.85	9.05	8.00 10.00	0.31	1.00 1.52
15059	Eastern States 8-12-13 Auburn	G 6.53	1.50	0.13	8.00	12.00		16.00		1.00
15100	Woodland	F 6.47	1.65	0.00	8.19 8.12	12.95 12.44	13.21	16.40 16.68	0.16 0.31	2.24 2.20
15197	Patten	G 6.40	1.59	0.00	8.00 7.99	12.00 13.95	12.50 14.13	16.00 15.94	0.29	1.00 2.20

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Station number	Name and Address of Manufacturer, Brand, and Town Where Sampled	NITROGEN				PHOSPHORIC ACID		POTASH	MAGNESIUM OXIDE	
		As ammonia %	As nitrate %	As organic %	Total %	Avail. %	Total %	Water soluble %	Water soluble %	Total %
15009	Eastern States 8-12-20 Woodland	*G 6.60	1.24	0.37	8.00	12.00	12.38	20.00	0.16	1.00
15058	Eastern States 8-16-8 Auburn	G 6.26	1.54	0.41	8.00	16.00	15.89	8.00	0.33	1.00
15055	Eastern States 8-10-16 Brewer	G 6.26	1.39	0.37	8.00	16.00	17.27	16.00	0.33	1.00
15196	Eastern States 8-10-16 LC Patten	G 6.23	1.53		8.00	16.00	16.50	16.00	0.24	0.50
15102	ECONOMY FERTILIZER CO., FORT KENT, ME. Fort Kent	G 4.41	1.76	0.28	6.00	9.00	10.74	15.00	1.65	1.50
15211	A. W. HIGGINS CO., INC., PRESQUE ISLE, ME. Caribou	G 5.21	1.57	1.50	8.00	12.00	12.00	16.00	2.44	2.00
15089	Higgins First in the Field 8-12-16-2 Presque Isle	G 5.40	1.29	1.35	8.00	12.00	12.30	16.00	2.23	2.00
15184	A. H. HOFFMAN, INC., LANDISVILLE, PA. Hoffman's Victory Garden Fertilizer 5-10-5 Lewiston	G 2.34	1.91	0.80	5.00	10.00	11.19	5.00	5.82	2.71

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		As ammonia %	As nitrate %	As organic %	Total %	Avail-able %	Total %	Water soluble %	Total %
15176	HYDROPONIC CHEMICAL CO., INC., Hyponex Waterville	*G *F 1.39	5.75		7.00 7.14	6.87	6.00 6.92	19.00 20.10	
15177	HY-TROUS CORPORATION, BOSTON, MASS. Hy-Trous 4-8-4 Fertilizer Waterville	G F 0.20	1.52	2.58	4.00 4.30	8.00 8.38	8.38	4.00 5.40	
15121	INTERNATIONAL FERTILIZERS, LTD., Albatros Fertilizer 3-12-6 West Farmington	G F 4.21	0.91	0.18	3.00 5.30	12.00 9.48	12.00 9.53	6.00 4.96	
15104	Albatros Fertilizer 5-7-10 Caribou	G F 3.82	0.91	0.63	5.00 5.36	7.00 8.00	7.00 8.03	10.00 8.92	1.00 1.10
15122	Albatros Fertilizer 5-8-7 West Farmington	G F 3.97	0.81	0.45	5.00 5.23	8.00	8.00	7.00 6.94	1.00 0.90
15119	Albatros Fertilizer 5-10-5 West Farmington	G F 2.42	0.83	0.22	5.00 3.47	10.00 11.57	10.00 11.62	5.00 5.58	
15120	Albatros Fertilizer 5-10-10 West Farmington	G F 4.27	0.74	0.37	5.00 5.38	10.00 9.24	10.00 9.34	10.00 9.12	1.00 0.98
15171	Caribou	G F 3.56	0.83	0.52	5.00 4.91	10.00 10.00	10.00 10.09	10.00 9.96	1.00 1.10
15201	Palmyra	G F 3.54	0.76	0.57	5.00 4.87	10.00 9.77	10.00 9.85	10.00 9.70	1.00 1.12
15105	Albatros Fertilizer 6-9-15 Caribou	G F 4.62	0.88	0.72	6.00 6.22	9.00 9.00	9.00 9.10	15.00 15.16	1.50 1.74

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			As ammonia %	As nitrate %	As organic %	Total %	Avail-able %	Total %	Water soluble %	Water soluble %	Total %
	INTERNATIONAL MINERALS & CHEMICAL CORP., WOBURN, MASS.	*G *F									
15143	International Caribbean 5-10-10-2	G	2.79	1.31	1.00	5.00	10.00	10.74	10.00	3.42	2.00
15222	Belfast	F	2.87	1.12	1.01	5.00	10.29	10.68	10.16	2.15	3.53
15220	Kennebunk	G									
	International 3-12-3 Lawn and Garden	F	1.80	0.82	0.63	3.00	12.00	13.56	3.00		3.16
	Saco	F				3.25	12.52		3.08		
15113	International 3-12-6	G				3.00	12.00	12.83	6.00		
	Skowhegan	F	2.43	0.82	0.24	3.54	12.37		7.50		
15249	International 5-7-10	G				5.00	7.00	7.00	10.00		1.00
	Fort Kent	F	4.35	0.30	0.51	5.16	7.03	7.25	10.30	0.45	1.63
15070	International 5-7-10-1	G				5.00	7.00	7.35	10.00		1.00
	Houlton	F	4.60	0.35	0.23	5.21	7.09		10.40	0.34	1.74
15072	International 5-7-10-2 Special	G				5.00	7.00	7.16	10.00	2.00	
	Houlton	F	4.71	0.47	0.20	5.38	7.02		10.62	2.22	3.69
15135	International 5-8-7	G				5.00	8.00	9.13	7.00		
	Waldoboro	F	3.65	1.02	0.13	4.80	8.35		9.20		
15147	International 5-10-5	G				5.00	10.00	10.78	5.00		
	Belfast	F	3.53	0.88	0.72	5.13	10.00		5.70		
15124	International 5-10-10	G				5.00	10.00	10.84	10.00		
	Waldoboro	F	3.94	1.17		5.11	10.25	10.97	10.16		
15242	Mercer	F	3.76	0.82	0.34	4.92	10.24		10.06		
15164	International 6-9-15	G				6.00	9.00	9.70	15.00		
	East Newport	F	4.91	0.97	0.17	6.05	9.44		14.92		

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		As ammonia %	As nitrate %	As organic %	Total %	Avail-able %	Total %	Water soluble %	Water soluble %	Total %
15071	International 6-9-15-1½ Houlton	*G *F 5.12	1.03	0.15	6.00 6.30	9.00 9.67	9.98	15.00 15.32	0.45	1.50 1.83
15146	International 7-7-7 Belfast	G F 5.95	1.01	0.18	7.00 7.14	7.00 7.32	7.59	7.00 7.33		
15074	International 8-12-16-1½ Houlton	G F 6.56	0.90	0.19	8.00 7.65	12.00 12.10	12.19	16.00 16.00	0.52	1.50 1.90
15144	International 8-16-16 Belfast	G F 6.69	1.04	0.29	8.00 8.02	16.00 16.39	16.47	16.00 16.60		
15133	International Victory Garden 5-10-5 Waldoboro	G F 3.58	1.10	0.50	5.00 5.18	10.00 9.80	10.44	5.00 5.94		
15193	Houlton	G F 4.46	0.64	0.71	5.00 5.81	10.00 10.10	10.44	5.00 5.86		
15185	KEMICAL CORPORATION, EAST PATERSON, N. J. Kem. Liquid Plant Food Lewiston	G F	0.12	0.00	0.08 0.12	0.16 0.17	0.17	0.10 0.23		
15053	MORISON BROS., BANGOR, ME. Morison Bros. 8-12-6 Fertilizer Bangor	G F 2.32	0.36	0.78	3.00 3.46	12.00 12.57	12.00 12.85	6.00 6.09	1.00 1.28	1.41
15051	Morison Bros. 5-7-10 Fertilizer Bangor	G F 3.87	0.40	1.00	5.00 5.27	7.00 7.37	7.00 7.71	10.00 9.00	1.00 1.23	1.05
15049	Morison Bros. 5-8-7 Fertilizer Bangor	G F 3.71	0.47	0.77	5.00 4.95	8.00 8.77	8.00 8.97	7.00 7.30	1.00 1.39	1.43

* These letters indicate guaranteed and found, respectively.

Analyses of Samples of Mixed Fertilizers

Station number	Name and Address of Manufacturer, Brand, and Town Where Sampled	NITROGEN				PHOSPHORIC ACID		POTASH		MAGNESIUM OXIDE	
		As ammonia %	As nitrate %	As organic %	Total %	Avail-able %	Total %	Water soluble %	Water soluble %	Water soluble %	Total %
15350	Morison Bros. 5-10-5 Fertilizer Bangor	G 4.03	*F 0.45	0.81	5.00 5.23	10.00 10.11	10.00 10.57	5.00 6.20	1.00 1.18	1.00 1.18	1.47
15352	Morison Bros. 5-10-10 Fertilizer Bangor	G 4.01	F 0.17	1.05	5.00 5.23	10.00 10.51	10.00 10.97	10.00 9.30	1.00 1.52	1.00 1.52	1.70
15054	Morison Bros. 6-9-15 Fertilizer Bangor	G 4.55	F 0.52	1.42	6.00 6.49	9.00 8.84	9.00 9.32	15.00 16.18	1.00 1.30	1.00 1.30	1.45
15167	OLD DEERFIELD FERTILIZER CO., INC., SOUTH DEERFIELD, MASS. Washburn	G 4.81	F 0.45	4.22	9.00 9.48	12.60 13.19	12.60 13.28	18.00 18.52	1.77	2.00 2.60	
15178	PLANTABBS CO., BALTIMORE, MD. Fulton's V Plantabbs Waterville	G 0.12	F 0.00	4.40	4.00 4.52	12.00 12.71	12.99	18.00 19.08			
15192	A. F. PRINGLE AND COMPANY, CHARLESTON, S. C. Merco 6-9-15 Houlton	G 4.53	F 0.80	0.25	6.00 5.63	9.00 9.97	11.00 11.00	15.00 15.04	0.34	0.44	
15190	ROGERS & HUBBARD CO., PORTLAND, CONN. Red H Brand 3-12-5 Westbrook	G 2.16	F 0.41	0.58	3.00 3.15	12.00 12.26	12.59	6.00 6.06			

* These letters indicate guaranteed and found, respectively.

Analyses of Samples of Mixed Fertilizers

Station number	Name and Address of Manufacturer, Brand, and Town Where Sampled	NITROGEN				PHOSPHORIC ACID		POTASH	MAGNESIUM OXIDE	
		As ammonia %	As nitrate %	As organic %	Total %	Avail-able %	Total %	Water soluble %	Water soluble %	Total %
15131	Red H Brand 5-8-7 Westbrook	*G *F 3.32	0.13	1.65	5.00 5.10	8.00 8.18	8.54	7.00 6.94		
15132	Red H Brand 5-10-10 Westbrook	G F 3.67	0.18	1.36	5.00 5.21	10.00 10.39	10.76	10.00 9.50		
15233	SAGADAHOC FERTILIZER CO., INC., BOWDOINHAM, ME. All Food Fertilizer for Lawns, Flowers, Vegetables Bowdoinham	G F 3.07	0.42	0.95	4.00 4.44	12.00 13.41	12.00 13.63	4.00 4.92	1.00 2.01	2.10
15128	Sagadahoc 3-12-6 Danyville	G P 2.44	0.65	0.21	3.00 3.30	12.00 12.05	12.00	6.00 7.54	1.00 1.16	1.00 1.31
15225	Springvale	F 2.30	0.70	0.27	3.27	12.30	12.64	6.36	1.19	1.29
15116	Sagadahoc 5-8-7 Anson	G F 4.03 3.82	0.81 0.85	0.23 0.38	5.00 5.07 5.05	8.00 7.78 7.74	8.00	7.00 7.10 7.02	1.00 1.22 1.43	1.00
15224	Springvale									
15117	Sagadahoc 5-10-5 Anson	G F 4.33 4.39	0.70 0.73	0.20 0.28	5.00 5.23 5.40	10.00 9.69 10.19	10.00 9.98 10.47	5.00 5.36 5.50	1.00 1.23 1.23	1.00 1.32 1.46
15163	Dover-Foxcroft									
15114	Sagadahoc 5-10-10 Madison	G 3.65	0.72	0.70	5.00	10.00	10.00	10.00	2.00	2.00
15187	Oxford	F 3.74	0.65	0.99	5.07 5.38	10.01 10.47	10.12 10.65	8.95 10.32	1.81 2.30	1.85 2.38
15234	Sagadahoc 6-9-15 Bowdoinham	G F 3.00	0.41	2.67	6.00 6.03	9.00 8.60	9.00 8.91	15.00 16.49	1.50 1.77	1.50 1.80

* These letters indicate guaranteed and found, respectively.

Analyses of Samples of Mixed Fertilizers

Station number	Name and Address of Manufacturer, Brand, and Town Where Sampled	NITROGEN			PHOSPHORIC ACID	POTASH	MAGNESIUM OXIDE	
		As ammonia %	As nitrate %	As organic %			Water soluble %	Total %
15108	Sagadahoc Victory Garden Fertilizer 5-10-5 Waterville	*G 4.42 *F	1.00	0.24	10.00 9.31	5.00 6.09	1.34	1.00 1.37
15106	SMITH DOUGLASS CO., INC., NORFOLK, VA. Smith 5-10-10 Fertilizer Presque Isle Houlton	G 4.52 F	0.49	0.22	10.00 10.46 10.17	10.00 10.36 10.44	1.52 1.43	1.00 1.77 1.95
15195		F 4.55	0.46	0.28	9.00	15.00		1.50
15081		G 5.50 F	0.35	0.21	8.88 9.29	15.78	0.92	1.88
15194		F 5.55	0.42	0.31	8.80 9.34	15.78	1.27	1.89
15207	Thomasston	F 5.21	0.38	0.49	9.60	15.82	1.36	1.48
15168	Top Tater 5-10-10 Potato Fertilizer	G 4.55 F	0.48 0.30	0.18 0.28	10.00 10.20 10.22 10.57	10.00 9.82 9.18 11.24	1.25 2.31 2.49	1.00 2.31 2.49
15216	Presque Isle Caribou	F 4.55			9.00	15.00		1.50
15093	Top Tater 6-9-15 Potato Fertilizer	G 5.45 F	0.36 0.22	0.38 0.54	9.02 8.92	15.00 15.38 15.24	1.50 1.45	1.50 1.71 1.74
15217	Presque Isle Caribou	F 5.50			9.00	15.00		1.50
15183	SUMMERS FERTILIZER CO., INC., SEARSPORT AND BANGOR, ME., AND ST. STEPHEN, N. B. Summers Best on Earth 3-12-6	G 2.44 F	0.69	0.23	12.00 11.35	6.00 6.09		
15238		F 2.42	0.67	0.25	11.27	6.44		
15238	Bangor Corinna							

* These letters indicate guaranteed and found, respectively.

Analyses of Samples of Mixed Fertilizers

Station number	Name and Address of Manufacturer, Brand, and Town Where Sampled	NITROGEN				PHOSPHORIC ACID		POTASH		MAGNESIUM OXIDE	
		As ammonia %	As nitrate %	As organic %	Total %	Avail-able %	Total %	Water soluble %	Water soluble %	Water soluble %	Total %
15078	Summers Best on Earth 5-7-10 Houlton	*G 4.27	0.64	0.10	5.00	7.00	7.00	10.00	1.93	1.00	1.00
15110	Skowhegan	G 3.58	0.81	0.53	5.00	6.83	6.97	10.28	1.00	1.00	2.35
15213	Caribou	G 4.03	0.47	0.36	5.00	7.39	7.71	10.40	1.61	1.00	1.77
15106	Summers Best on Earth 5-8-7 Caribou	G 3.74	0.70	0.67	5.00	7.00	7.78	10.00	1.50	1.00	1.00
15205	Brooks	F 4.15	0.57	0.33	5.11	8.26	8.74	7.00	1.10	1.00	1.59
15206	Summers Best on Earth 5-10-5 Thomaston	G 3.97	0.63	0.53	5.00	8.23	8.43	7.68	1.10	1.00	1.35
15203	Summers Best on Earth 5-10-10 Unity	G 3.60	0.67	0.74	5.00	10.00	10.00	10.00	1.00	1.00	2.11
15204	Brooks	F 4.10	0.48	0.54	5.12	10.15	10.41	10.00	1.32	1.00	1.47
15157	Summers Best on Earth 6-9-15 Bangor	G 3.80	0.73	1.23	6.00	9.00	9.00	15.00	1.50	1.00	2.08
15174	Plymouth	F 4.14	0.57	1.35	6.06	10.52	10.71	13.46	1.61	1.00	2.01
15209	Houlton	G 3.76	0.54	1.45	6.00	9.00	9.00	15.00	1.79	1.00	1.50
15251	Summers Best on Earth Fertilizer 6-9-15 Special Dehydrators Fertilizer Caribou	F 4.24	0.21	1.81	5.75	9.88	10.14	13.69	5.39	1.00	5.55
15156	SWIFT & CO. FERTILIZER WORKS, BALTIMORE, MD. Vigoro 4-12-4 Bangor	G 3.53	0.65	0.25	6.00	9.00	9.00	15.00	5.82	1.00	1.50
					6.26	9.11	9.26	14.65	4.00	5.86	
					4.48	12.00	12.53	4.83			

* These letters indicate guaranteed and found, respectively.

Analyses of Samples of Mixed Fertilizers

Station number	Name and Address of Manufacturer, Brand, and Town Where Sampled	NITROGEN				PHOSPHORIC ACID		POTASH	MAGNESIUM OXIDE	
		As ammonia %	As nitrate %	As organic %	Total %	Avail. %	Total %	Water soluble %	Water soluble %	Total %
15160	Vigoro 5-10-5 Victory Garden Fertilizer Bangor	*G *F 4.25	0.73	0.16	5.00 5.14	10.00 10.67	10.86	5.00 5.62		
15221	TENNESSEE CORPORATION, Loma 5-10-5 NEW YORK, N. Y. Biddeford	G F 4.55	0.16	0.43	5.00 5.14	10.00 10.21	10.34	5.00 5.46		
15247	Loma Victory Garden Fertilizer Randolph	G F 4.16	0.17	0.54	5.00 4.87	10.00 10.00	10.14	5.00 5.22		

* These letters indicate guaranteed and found, respectively.

TABLE 2
Analyses of Samples of Manure

Station number	Name and Address of Manufacturer, Brand, and Town Where Sampled		Nitrogen %	PHOSPHORIC ACID		Total Potash %
				Avail-able %	Total %	
15190	American Agricultural Chemical Co., North Weymouth, Mass. Sheep Manure Rumford	*G	1.25		1.00	3.00
		*F	2.06	1.27	1.47	4.52
15153	Armour Fertilizer Works, Cartaret, N. J. Sheep Manure Searsport	G	1.50		1.00	2.00
		F	2.01	1.38	1.56	4.38
15179	Atkins & Durbrow, Inc., New York, N. Y. Driconure Waterville	G	2.00	1.00		1.00
		F	2.19	2.87	3.09	1.70
15140	Consolidated Rendering Co., Boston, Mass. Coreneo Brand Sheep Manure Camden	G	1.25	1.00		2.00
		F	1.76	1.46	1.61	3.68
15102	A. H. Hoffman, Inc., Landisville, Pa. Hoffman's Cow Manure "Dehydrated" 2-1-1 Bangor	G	2.00	1.00		1.00
		F	2.14	1.23	1.86	2.32
15180	Hoffman's Sheep Manure Waterville	G	1.50		1.00	2.50
		F	1.72	1.34	1.54	4.04
15145	International Minerals & Chemical Corp., Woburn, Mass. International Sheep Manure Belfast	G	1.25		1.00	2.00
		F	2.23	1.46	1.57	4.78
15118	Long Branch Sheep Farm, Bowdoinham, Me. Pulverized Sheep Manure Fertilizer Anson	G	1.00	2.00		1.00
		F	1.56	4.51	4.79	1.04
15129	Harold L. Norwood, North Reading, Mass. Norwood Brand Sheep Manure Portland	G	1.83	0.89		1.03
		F	1.61	0.29	0.39	3.08
15115	Pulverized Manure Co., Chicago, Ill. Wizard Brand Pulverized Sheep Manure Madison	G	2.00	1.00		2.00
		F	2.64	1.94	2.05	2.76
15182	Sagadahoc Fertilizer Co., Inc., Bowdoinham, Me. Goat Manure Lisbon Falls	G	1.25	1.00	1.00	2.00
		F	1.58	2.56	2.75	3.18
15175	Stockdale Fertilizer Co., Morris, Ill. Ovane Plant Food Waterville	G	2.00	1.00		2.00
		F	2.14	1.33	1.52	3.06
15111	Summers Fertilizer Co., Inc., Searsport, Me. Summers Sheep Manure Skowhegan	G	1.00		1.00	1.00
		F	1.76	0.75	0.86	3.52

* These letters indicate guaranteed and found, respectively.

Analyses of Samples of Manure—Continued

Station number	Name and Address of Manufacturer, Brand, and Town Where Sampled		Nitrogen %	PHOSPHORIC ACID		Total Potash %
				Avail-able %	Total %	
15150	Swift & Co. Fertilizer Works, Baltimore, Md. Swift's Pulverized Sheep Manure Bangor	*G	1.50		1.00	2.50
		*F	1.72	2.04	2.08	3.84
15124	Walker-Gordon Laboratory Co., Inc., Plainsboro, N. J. Bovung, Cow Manure Livermore Falls	G	2.00	1.00		1.00
		F	2.48	1.32	1.48	2.28

* These letters indicate guaranteed and found, respectively.

TABLE 3

Analyses of Samples of Ground Bone

Station number	Name and Address of Manufacturer or Wholesaler, and Brand	Sample taken at	NITROGEN		TOTAL PHOSPHORIC ACID	
			Guar-anteed %	Found %	Guar-anteed %	Found %
15138	American Agricultural Chemical Co., North Weymouth, Mass.					
*15241	Fine Ground Bone	Rockland	2.47	2.79	23.00	23.72
		Farmington	2.47	2.75	23.00	23.46
15243	Consolidated Rendering Co., Boston, Mass. Corenco Ground Bone	Waterville				
			2.47	3.36	23.00	23.65
15240	A. H. Hoffman, Inc., Landisville, Pa. Hoffman's Bone Meal	Bangor				
			3.70	3.69	20.00	19.51
15245	Rogers & Hubbard Co., Portland, Conn. Hubbard's Raw Knuckle Bone Flour	Bangor				
			3.70	4.25	24.70	23.67
†15183	Sagadahoc Fertilizer Co., Inc., Bowdoinham, Me. Animal Bone Meal	Lisbon Falls				
			3.70	3.71	16.00	15.81
15244	Summers Fertilizer Co., Inc., Searsport, Me. Summers Bone Meal	Bangor	3.00	4.27	20.00	23.93

* Guaranteed 9.00 per cent available phosphoric acid, found 13.60 per cent.

† Guaranteed 10.00 per cent available phosphoric acid, found 10.63 per cent.

TABLE 4
Analyses of Samples of Superphosphate

Station number	Name and Address of Manufacturer or Wholesaler	Sample taken at	PHOSPHORIC ACID			
			Available		Total	
			Guaranteed %	Found %	Guaranteed %	Found %
15068	American Agricultural Chemical Co., North Weymouth, Mass.	Portland	18.00	18.95		19.05
15152	Armour Fertilizer Works, Searsport, Me.	Searsport	20.00	20.08		20.55
15200	Consolidated Rendering Co., Boston, Mass.	Skowhegan	19.00	19.50		19.72
15060	Eastern States Farmers' Exchange, West Springfield, Mass.	Auburn	20.00	21.15		21.84
15219	International Minerals & Chemical Corp., Woburn, Mass.	Biddeford	20.00	20.48		20.88
15123	Sagadahoc Fertilizer Co., Inc., Bowdoinham, Me.	North Jay	20.00	20.08	20.00	20.30
15208	Summers Fertilizer Co., Inc., Searsport, Me.	Thomaston	20.00	20.49	20.00	20.52

TABLE 5
Analyses of Samples of Liming Materials

Station number	Name and Address of Manufacturer or Wholesaler and Brand	Calcium Oxide		Magnesium Oxide		Fineness				
		Guaranteed %	Found %	Guaranteed %	Found %	Passed 20 mesh %	Passed 40 mesh %	Passed 60 mesh %	Passed 80 mesh %	Passed 100 mesh %
15085	Aroostook Federation of Farmers, Caribou, Me. Lime and Potash†	*	45.60		1.91	99.90	97.90	96.90	95.90	94.10
15161	A. H. Hoffman, Inc., Landisville, Pa. Hoffman's Hydrated Lime	70.00	68.40	1.00	1.67	100.00	99.80	99.60	99.20	98.70
15136	Lawrence Portland Cement Co., Thomaston, Me. Dragon "Mainrok" Standard Ground Agricultural Limestone	35.00	52.68	0.20	0.64	100.00	99.20	95.70	90.40	85.20
15086	Lee Lime Corporation, Lee, and West Stockbridge, Mass. Lee Pulverized Limestone	30.00	31.36	20.00	20.79	100.00	95.50	85.00	73.50	63.10
15215	Tobey Pulverized Limestone	35.00	42.76	10.00	8.51	99.70	97.30	93.80	90.00	86.20
15252	Clifford L. Miller, West Stockbridge, Mass. Agricultural Limestone Pulverized Monarque	39.00	47.48	11.00	5.72	98.40	87.40	76.60	68.30	63.20
15226	Rockland-Rockport Lime Co., Inc., Rockland, Me. R.R. Ground Limestone, Grade C	33.00	50.88	0.00	2.00	99.90	98.90	93.40	83.70	74.30
15137	R.R. Land Lime	60.00	61.78	0.50	0.51	99.90	82.00	62.40	49.10	40.60
15240	Swanton Lime Works, Inc., Swanton, Vt. Sollsweet. Standard Ground Limestone	50.00	54.56	2.00	1.03	94.80	73.20	64.90	59.10	55.10
15223	Vermarco Lime Co., West Rutland, Vt. "Vermarco" "Trade Mark" Agricultural Limestone Pulverized	54.00	52.60	1.00	1.07	100.00	99.90	99.40	98.00	96.50

* Guaranteed to contain 60 per cent calcium.

† Equivalent to calcium hydroxide 60.34 per cent.

‡ Guaranteed to contain potash 2.00 per cent, found 2.36 per cent.

MISCELLANEOUS MATERIALS

Station
number

- 15109 Arcadian, The American Nitrate of Soda
Allied Chemical & Dye Corporation, New York, N. Y.
Guaranteed 16 per cent total nitrogen, found 15.90 per cent.
- 15253 Sulphate of Ammonia
Allied Chemical & Dye Corporation, New York, N. Y.
Found 20.81 per cent total nitrogen.
- 15073 Nitraprills, Fertilizer Compound
Ashcraft-Wilkinson Co., Atlanta, Ga.
Guaranteed 32.5 per cent total nitrogen, found 32.86 per cent.
- 15218 Nitraprills, Fertilizer Compound
Ashcraft-Wilkinson Co., Atlanta, Ga.
Guaranteed 32.5 per cent total nitrogen, found 32.86 per cent.
- 15065 Chilean Nitrate of Soda, Champion Brand
Chilean Nitrate Sales Corp., New York, N. Y.
Guaranteed 16 per cent total nitrogen, found 15.86 per cent.
- 15090 Uramon Fertilizer Compound
E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
Guaranteed 42 per cent total nitrogen, found 42.13 per cent.
- 15127 Eastern States Muriate of Potash
Eastern States Farmers' Exchange, West Springfield, Mass.
Guaranteed 60 per cent potash, found 61.19 per cent.
- 15188 Muriate of Potash
Sagadahoc Fertilizer Co., Inc., Bowdoinham, Me.
Guaranteed 61 per cent potash, found 59.44 per cent.
- 15235 Sul-Po-Mag
Sagadahoc Fertilizer Co., Inc., Bowdoinham, Me.
Guaranteed 21.5 per cent potash, found 21.64 per cent; guaranteed 18.5 per cent
water soluble magnesium oxide, found 18.01 per cent; found 18.33 per cent
total magnesium oxide.
- 15139 Milorganite
Sewerage Commission, Milwaukee, Wis.
Guaranteed 6 per cent total nitrogen, found 5.77 per cent; guaranteed 2.0 per
cent available phosphoric acid; found 2.65 per cent; found 3.06 per cent total
phosphoric acid.

SUMMARY

Materials	Total number of samples	Number of samples below guaranty in						
		Total nitrogen	Available phosphoric acid	Total phosphoric acid	Water soluble potash	Total potash	Water soluble magnesium oxide	Total magnesium oxide
Mixed fertilizers	155	25	32	10	30		7	5
Manure	15	1	1	1				
Ground bone	7	1		3				
Superphosphate	7							
Liming materials	10							3
Miscellaneous materials	10	3			1		1	
Totals	204	30	33	14	31		8	8
								2

DEFINITIONS OF TERMS AND INTERPRETATIONS OF RESULTS ON FERTILIZERS AND LIMING MATERIALS*

DEFINITIONS

ACID-FORMING AND NON-ACID-FORMING FERTILIZERS

An *acid-forming fertilizer* is one that is capable of increasing the residual acidity of soil (adopted 1936).

A *non-acid-forming fertilizer* is one that is not capable of increasing the residual acidity of the soil (adopted 1936).

ACIDULATED FISH TANKAGE, ACIDULATED FISH SCRAP

Acidulated fish tankage, acidulated fish scrap, is the rendered product derived from fish and treated with sulfuric acid (adopted 1930).

ACTIVATED SEWAGE PRODUCTS

Activated sewage products are those made from sewage freed from grit and coarse solids and aerated after being inoculated with microorganisms.

* Official and Tentative Methods of Analysis of the Association of Official Agricultural Chemists, Fifth Edition, 1940.

The resulting flocculated organic matter is withdrawn from the tanks, filtered with or without the aid of coagulants, dried, ground, and screened (adopted 1930).

AGRICULTURAL LIMING MATERIAL

Agricultural liming material is material whose calcium and magnesium content is capable of neutralizing soil acidity (adopted 1935).

AIR-SLAKED LIME

Air-slaked lime is a product composed of varying proportions of the oxide, hydroxide, and carbonate of calcium, or of calcium and magnesium, and derived from exposure of quicklime (adopted 1936).

AMMONIATED SUPERPHOSPHATE

Ammoniated superphosphate is the product obtained when superphosphate is treated with ammonia or with a solution containing free ammonia and other forms of nitrogen dissolved therein (adopted 1939, first action).

ANALYSIS

The word *analysis*, as applied to fertilizers, shall designate the percentage composition of the product expressed in those terms that the law requires and permits (adopted 1938).

ASHES FROM LEACHED WOOD

Ashes from leached wood are unleached ashes resulting from burning wood that has been exposed to or digested in water or other liquid solvent, as in the extraction of dyes, so that a part of the plant food has been dissolved and removed (adopted 1926).

AVAILABLE PHOSPHORIC ACID

Available phosphoric acid is the sum of the water-soluble and the citrate-soluble phosphoric acid (adopted 1931).

"BASIC" LIME PHOSPHATE

"Basic" lime phosphate (lime-based superphosphate) is a superphosphate to which liming materials have been added in a quantity at least six per cent (6%) calcium carbonate equivalents in excess of the quantity required to convert all water-soluble phosphate to the citrate-soluble form (adopted 1934.)

BASIC PHOSPHATE SLAG

Basic phosphate slag is a by-product in the manufacture of steel from phosphatic iron ores. The product shall be finely ground and shall contain

no admixture of materials other than what results in the original process of manufacture. It shall contain not less than twelve per cent (12%) of total phosphoric acid (P_2O_5), not less than eighty per cent (80%) of which shall be soluble in two per cent (2%) citric acid solution according to the Wagner method of analysis, II, 67 or 68. Any phosphate slag not conforming to this definition shall be designated *low grade* (adopted 1925).

BAT GUANO

Bat guano is partially decomposed bat manure (adopted 1938).

BAT MANURE

Bat manure is the dry excrement from bats (adopted 1938).

BRAND AND BRAND NAME

A *brand* is a term, design, or trademark used in connection with one or several grades of fertilizers (adopted 1926).

A *brand name* is a specific designation applied to an individual fertilizer (adopted 1926).

CALCIUM NITRATE

Calcium nitrate (nitrate of lime) is a commercial product consisting chiefly of calcium nitrate, and it shall contain not less than fifteen per cent (15%) of nitrogen (adopted 1939, first action).

CITRATE-SOLUBLE ("REVERTED") PHOSPHORIC ACID

Citrate-soluble ("reverted") phosphoric acid is that part of the total phosphoric acid in a fertilizer that is insoluble in water but soluble in a solution of citrate of ammonia according to the method adopted by the A.O.A.C. (adopted 1932).

CRUDE, INERT, OR SLOW-ACTING NITROGENOUS MATERIALS

Crude, inert, or slow-acting nitrogenous materials are unprocessed organic substances relatively high in nitrogen but having a very low value as plant food and showing a low activity by both the alkaline and neutral permanganate methods below 50% and 80%, respectively (adopted 1929).

CYANAMID

Cyanamid is a commercial product composed chiefly of calcium cyanamide ($CaCN_2$), and it shall contain not less than twenty-one per cent (21%) of nitrogen (adopted 1935).

DICALCIUM PHOSPHATE

Dicalcium phosphate is a manufactured product consisting chiefly of a dicalcic salt of phosphoric acid (adopted 1931).

DISSOLVED BONE

Dissolved bone is ground bone or bone meal that has been treated with sulfuric acid (adopted 1926).

DOLOMITE

Dolomite is a mineral composed chiefly of carbonates of magnesium and calcium in substantially unimolal (1-1.19) proportions (adopted 1938).

DRIED BLOOD

Dried blood is the collected blood of slaughtered animals, dried, and ground and containing not less than twelve per cent (12%) of nitrogen in organic forms (adopted 1928).

DRIED, PULVERIZED, OR SHREDDED MANURES

Dried, pulverized, or shredded manures are what the name indicates, and not mixtures of manures and other materials (adopted 1925).

FERTILIZER GRADE

Fertilizer grade shall represent the minimum guaranty of its plant food expressed in terms of *nitrogen (not ammonia)*, *available phosphoric acid*, and *water-soluble potash* (adopted 1928).

FISH TANKAGE, FISH SCRAP, DRY GROUND FISH, FISH MEAL,
FERTILIZER GRADE

Fish tankage, fish scrap, dry ground fish, fish meal fertilizer grade, is the dried ground product derived from rendered or unrendered fish (adopted 1929).

GARBAGE TANKAGE

Garbage tankage is the rendered, dried, and ground product derived from waste household food materials (adopted 1929).

PULVERIZED LIMESTONE (FINE-GROUND LIMESTONE)

Pulverized limestone (fine-ground limestone) is the product obtained by grinding either calcitic or dolomitic limestone so that all the material will pass a 20-mesh sieve and at least seventy-five per cent (75%) will pass a 100-mesh sieve (adopted 1936).

GROUND Limestone (COARSE-GROUND Limestone)

Ground limestone (coarse-ground limestone) is the product obtained by grinding either calcitic or dolomitic limestone so that all the material will pass a 10-mesh sieve, and at least fifty per cent (50%) will pass a 100-mesh sieve (adopted 1936).

GROUND SHELLS

Ground shells is the product obtained by grinding the shells of mollusks so that not less than fifty per cent (50%) shall pass a 100-mesh sieve. The product shall also carry the name of the mollusk from which said product is made (adopted 1936).

GROUND SHELL MARL

Ground shell marl is the product obtained by grinding natural deposits of shell marl so that at least seventy-five per cent (75%) shall pass a 100-mesh sieve (adopted 1936).

GROUND RAW BONE

Ground raw bone is dried ground animal bones that have not been previously steamed under pressure (adopted 1929).

GROUND STEAMED BONE

Ground steamed bone is ground animal bones that have been previously steamed under pressure (adopted 1929).

GYPSUM, LAND PLASTER, OR CRUDE CALCIUM SULFATE

Gypsum, land plaster, or crude calcium sulfate are products consisting chiefly of calcium sulfate. They may contain twenty per cent (20%) of combined water. (They do not neutralize acid soils) (adopted 1931).

HIGH CALCIC PRODUCTS

High calcic products are materials of which 90% or more of the total calcium and magnesium content consists of calcium oxide (adopted 1935).

HIGH MAGNESIC PRODUCTS

High magnesian products are materials in which more than 10 per cent of the total calcium and magnesium oxide consists of magnesium oxide (adopted 1935).

HOOF AND HORN MEAL

Hoof and horn meal is processed dried, ground hoofs and horns (adopted 1929).

HYDRATED OR SLAKED LIME

Hydrated or slaked lime is a dry product consisting chiefly of the hydroxide of calcium and oxide-hydroxide of magnesium (adopted 1935).

KAINIT

Kainit is a potash salt containing potassium and sodium chlorides and sometimes sulfate of magnesia with not less than twelve per cent (12%) of potash (K_2O) (adopted 1928).

LEACHED WOOD ASHES

Leached wood ashes are ashes from burned unleached wood with part of their plant food removed by artificial means or by exposure to rains, snows, or other solvent (adopted 1928).

LIME

The word *lime* when applied to liming materials means either calcium oxide or calcium and magnesium oxides (adopted 1934).

MANGANESE

Manganese. The water-soluble (or available) manganese in fertilizers shall be expressed as manganese (Mn) (adopted 1935).

MANGANESE SULFATE

Manganese sulfate. The term manganese sulfate, when applied to an ingredient of a mixed fertilizer, shall designate anhydrous manganous sulfate ($MnSO_4$) (adopted 1935).

MANURE SALTS

Manure salts are potash salts containing high percentages of chloride and from twenty per cent (20%) to thirty per cent (30%) of potash (K_2O). The term *double manure salts* should be discontinued (adopted 1925).

MONOAMMONIUM PHOSPHATE (FERTILIZER GRADE)

Monoammonium phosphate (fertilizer grade) is a commercial salt made by combining phosphoric acid with ammonia. It shall contain not less than ten per cent (10%) of nitrogen and not less than forty-six per cent (46%) of available phosphoric acid (adopted 1934).

MURIATE OF POTASH (COMMERCIAL POTASSIUM CHLORIDE)

Muriate of potash (commercial potassium chloride) is a potash salt containing not less than forty-eight per cent (48%) of potash (K_2O), chiefly as chlorides (adopted 1929).

NITRATE OF POTASH (COMMERCIAL POTASSIUM NITRATE)

Nitrate of potash (commercial potassium nitrate) is a salt containing not less than twelve per cent (12%) of nitrogen and forty-four per cent (44%) of potash (K_2O) (adopted 1927).

NITRATE OF SODA (COMMERCIAL SODIUM NITRATE)

Nitrate of soda (commercial sodium nitrate) is commercial sodium nitrate containing not less than fifteen per cent (15%) of nitrogen, chiefly as sodium nitrate (adopted 1928).

PEAT

Peat is partly decayed vegetable matter of natural occurrence. It is composed chiefly of organic matter that contains some nitrogen of low activity (adopted 1931).

CHARRED PEAT

Charred peat is peat artificially dried at a temperature that causes partial decomposition (adopted 1931).

PHOSPHATE ROCK

Phosphate rock is a natural rock containing one or more calcium phosphate minerals of sufficient purity and quantity to permit its use, either directly or after concentration, in the manufacture of commercial products (adopted 1933).

PHOSPHORIC ACID

The term *phosphoric acid* designates phosphorus pentoxide (P_2O_5) (adopted 1934).

POTASH

The term *potash* designates potassium oxide (K_2O) (adopted 1934).

PRECIPITATED BONE PHOSPHATE

Precipitated bone phosphate is a by-product from the manufacture of glue from bones and is obtained by neutralizing the hydrochloric acid solution

of processed bone with calcium hydroxide. The phosphoric acid is chiefly present as dicalcium phosphate (adopted 1933).

PRECIPITATED PHOSPHATE

Precipitated phosphate is a product consisting mainly of dicalcium phosphate obtained by neutralizing with calcium hydroxide the acid solution of either phosphate rock or processed bone (adopted 1933).

PRIMARY FERTILIZER COMPONENTS

Primary fertilizer components are those at present generally recognized by law as necessary to be guaranteed in fertilizers, namely: nitrogen, phosphoric acid (P_2O_5), and potash (K_2O) (adopted 1938).

SECONDARY FERTILIZER COMPONENTS

Secondary fertilizer components are those other than the "primary fertilizer components" that are essential to the proper growth of plants and that may be needed by some soils. Some of these components are calcium, magnesium, sulfur, manganese, copper, zinc, and boron (adopted 1938).

PROCESS TANKAGES

Process tankages are products made under steam pressure from crude inert nitrogenous materials, with or without the use of acids, for the purpose of increasing the activity of the nitrogen. These products shall be called "Process Tankages" with or without further qualification. The water-insoluble nitrogen in these products shall test at least fifty per cent (50%) active by the alkaline, or eighty per cent (80%) by the neutral permanganate method (adopted 1931).

PRODUCTS SECURED BY HEATING CALCIUM PHOSPHATE WITH ALKALI SALTS CONTAINING POTASH

Products secured by heating calcium phosphate with alkali salts containing potash are non-acid phosphates with potash. They are *not* potassium phosphate (adopted 1928).

QUICK LIME, BURNED LIME, CAUSTIC LIME, LUMP LIME, UNSLAKED LIME

Quick lime, burned lime, caustic lime, lump lime, unslaked lime. These designations shall apply to calcined materials, the major part of which is calcium oxide, in natural association with a lesser amount of magnesium oxide, and which is capable of slaking with water (adopted 1935).

SHEEP MANURE—WOOL WASTE

Sheep manure—wool waste is the by-product from wool-carding establishments consisting chiefly of sheep manure, seeds, and wool fiber (adopted 1931).

SOFT PHOSPHATE WITH COLLOIDAL CLAY

Soft phosphate with colloidal clay is a very finely divided low-analysis by-product from mining Florida rock phosphate by a hydraulic process in which the colloidal materials settle at points in artificial ponds and basins farthest from the washer, and are later removed after the natural evaporation of the water (adopted 1933).

SULFATE OF AMMONIA (COMMERCIAL AMMONIUM SULFATE)

Sulfate of ammonia (commercial ammonium sulfate) is a commercial product composed chiefly of ammonium sulfate. It shall contain not less than twenty and five-tenths per cent (20.5%) of nitrogen (adopted 1931).

SULFATE OF POTASH-MAGNESIA

Sulfate of potash-magnesia is a potash salt containing not less than twenty-five per cent (25%) of potash (K_2O), nor less than twenty-five per cent (25%) of sulfate of magnesia, and not more than two and one-half per cent (2.5%) of chlorine (adopted 1925).

SULFATE OF POTASH (COMMERCIAL POTASSIUM SULFATE)

Sulfate of potash (commercial potassium sulfate) is a potash salt containing not less than forty-eight per cent (48%) of potash (K_2O) chiefly as sulfate, and not more than two and one-half per cent (2.5%) of chlorine (adopted 1929).

SUPERPHOSPHATE

Superphosphate is a product obtained by mixing rock phosphate with either sulfuric acid or phosphoric acid or with both acids. (The grade that shows the available phosphoric acid shall be used as a prefix to the name. *Example*: 20 per cent superphosphate) (adopted 1940).

TANKAGE

Tankage (without qualification) is the rendered, dried, and ground by-product, largely meat and bone from animals (slaughtered or that have died otherwise) (adopted 1929).

UNIT OF PLANT FOOD

A *unit of plant food* is twenty (20) pounds, or one per cent (1%) of a ton (adopted 1926).

UNLEACHED WOOD ASHES

Unleached wood ashes are ashes from burned unleached wood that have had no part of their plant food removed and that contain four per cent (4%) or more of water-soluble potash (K_2O), (adopted 1928).

WASTE LIME, BY-PRODUCT LIME

Waste lime, by-product lime, is any industrial waste or by-product containing calcium or calcium and magnesium in forms that will neutralize acids. It may be designated by prefixing the name of the industry or process by which it is produced, i.e., gas-house lime, tanners' lime, acetylene lime-waste, lime-kiln ashes, calcium silicate, etc. (adopted 1931).

INTERPRETATIONS

ACTIVITY OF WATER-INSOLUBLE NITROGEN IN MIXED FERTILIZERS

Activity of water-insoluble nitrogen in mixed fertilizers.—The alkaline and neutral permanganate methods distinguish between the better and the poorer sources of water-insoluble nitrogen, and do not show the percentage availability of the materials. The available nitrogen of any product can be measured only after carefully conducted vegetation experiments.

(a) The methods shall be used on mixed fertilizers containing water-insoluble nitrogen amounting to three-tenths of one per cent (0.3%) or more of the weight of the material. If a total nitrogen exceeds the minimum guaranty and is accompanied by a low activity of the insoluble nitrogen, the over-run shall be taken into consideration in determining the classification of the water-insoluble nitrogen.

(b) The water-insoluble nitrogen in mixed fertilizer showing an activity below fifty per cent (50%) by the alkaline method and also below eighty per cent (80%) by the neutral method shall be classed as inferior. This necessitates the use of both methods, also the provision as to over-run in (a), before classifying as inferior (adopted 1927).

AMOUNT OF CHLORINE PERMISSIBLE IN FERTILIZERS IN WHICH THE POTASH IS CLAIMED AS SULFATE

Amount of chlorine permissible in fertilizers in which the potash is claimed as sulfate.—The chlorine in mixed fertilizers in which the potash is claimed as sulfate shall not exceed one-half of one per cent (0.5%) more than what is called for in the minimum potash content based on the definition

of sulfate of potash as formulated by the Committee. Calculate as follows: 0.05 times the percentage of potash found plus 0.5 (adopted 1928).

BRAND NAME TO INCLUDE GRADE OF FERTILIZER

The grade of a fertilizer should be included with its brand name, and so used by the manufacturer on sacks and in printed literature and by the control official in his reports and publications (adopted 1927).

CYANAMIDE AND UREA NITROGEN

The nitrogen in cyanamide and urea is synthetic, non-protein organic nitrogen (adopted 1931).

FERTILIZER FORMULA

A *fertilizer formula* shall express the quantity and grade of the crude stock materials used in making a fertilizer mixture. For example: 800 pounds of 16% superphosphate, 800 pounds of tankage (7.40 nitrogen and 9.15 total phosphoric acid), and 400 pounds of sulfate of potash-magnesia (twenty-six per cent (26%) potash) (adopted 1926).

FINELY GROUND AS APPLIED TO BASIC PHOSPHATE SLAG

Finely ground in the definition of basic phosphate slag shall refer to actual size of particles as determined by the use of standard sieves, as follows: seventy per cent (70%) or more shall pass a 100-, and ninety per cent (90%) or more shall pass a 50-mesh sieve (adopted 1927).

THE WORD "LIME" AS APPLIED TO FERTILIZERS

The term "*lime*" shall not be used in the registration, labelling, or guaranteeing of fertilizers or fertilizing materials unless the lime is in a form or forms to neutralize soil acidity (adopted 1935).

NET WEIGHTS

The weights appearing on packages of fertilizer, agricultural lime, and liming materials shall always mean *net weights* (adopted 1932).

ORDER OF TERMS

The *order of terms* in mixed fertilizers shall be nitrogen first, phosphoric acid second, and potash third (adopted 1930).

NAME OF A FERTILIZER MATERIAL USED AS THE BRAND NAME OR PART OF THE BRAND NAME OF A MIXED FERTILIZER

When the name of a fertilizer material is used as a part of the brand name of a mixed fertilizer, as for example, blood, bone, or fish, the nitrogen

or phosphoric acid shall be derived from or supplied entirely by the material named. When the name of a fertilizer material is used as a brand or as part of a brand and the nitrogen or phosphoric acid is not supplied by the material named, the word "brand" shall follow the name of the materials. Example: "Fish Brand Fertilizer" (adopted 1930).

STATEMENT OF GUARANTIES

The *statement of guaranties* of mixed fertilizers shall be given in whole numbers (adopted 1930).

UNIFORMITY IN USE OF TERMS "PHOSPHORIC ACID" AND "POTASH"

As the terms *phosphoric acid* and *potash* are used universally in guaranteeing and in reporting the analyses of fertilizers, it is recommended that the same terms also be used in reporting and discussing the results of analyses of related materials (adopted 1934).

SUPPLEMENTARY*

NITRATE OF SODA AND POTASH

Nitrate of soda and potash is a commercial product containing nitrates of sodium and potassium and it shall contain not less than fourteen per cent (14%) of nitrogen (N) and fourteen per cent (14%) of potash (K_2O).

MAGNESIUM OXIDE

Magnesium oxide is a commercial product containing not less than ninety-two per cent (92%) of the oxide of magnesium.

GUARANTEEING IN TERMS OF ELEMENTS

All fertilizer components with the exception of potash (K_2O) and phosphoric acid (P_2O_5) if guaranteed shall be stated in terms of the elements.†

*Jour. A.O.A.C., Vol. XXIV, No. 1.

†By regulation issued by the Maine Commissioner of Agriculture magnesium, if guaranteed, shall be stated in terms of the oxide (MgO) effective January 1, 1934.

Chief Requirements of the Law and Rules and Regulations promulgated by the Commissioner of Agriculture governing Quality, Purity, Registration, and Control of Commercial Fertilizers.

A. M. G. Soule, Chief
Division of Inspection, Augusta, Maine

LAW GOVERNING QUALITY, PURITY AND REGISTRATION OF COMMERCIAL FERTILIZERS

Chapter 41, Revised Statutes

Protection Against Adulterated or Misbranded Goods

Sec. 1. Sale of certain adulterated articles prohibited. No person shall, within this state, manufacture, sell, distribute, transport, offer or expose for sale, distribution, or transportation, any article of commercial fertilizer, which is adulterated or misbranded within the meaning of this chapter.

Sec. 2 Definition. The term "commercial fertilizer" as used herein shall be held to include all materials used for fertilizing purposes, the price of which exceeds ten dollars a ton.

Sec. 12. Markings of packages of commercial fertilizer. Every lot or package of commercial fertilizer, which is manufactured, sold, distributed, transported, offered or exposed for sale, distribution, or transportation in the state by any person shall have affixed in a conspicuous place on the outside thereof a plainly printed statement clearly and truly giving the number of net pounds in the package; the name, brand or trade mark under which the fertilizer is sold; the name and principal address of the manufacturer or importer; and a chemical analysis stating the minimum percentage of nitrogen, available as plant food, present as nitrates, ammonium salts or organic nitrogen, of potash, soluble in water, of phosphoric acid in available form, soluble and reverted, and of total phosphoric acid, the constituents to be determined by the methods adopted by the association of official agricultural chemists, and the minimum percentage of magnesium soluble in water and/or total magnesium. If the fertilizer is sold in bulk or put up in containers furnished by the purchaser, the seller shall, upon request of the purchaser, furnish the latter with a copy of the statements named in this section.

Sec. 13. Lime, marl or wood-ashes classed as a commercial fertilizer; statement of percentage; fee for certificate. Lime, marl or wood-ashes intended for fertilizing purposes, and without regard to the price at which it is sold or offered for sale, shall be classed as a commercial fertilizer within the meaning of this chapter. All the requirements and penalties relative to commercial fertilizers named in this chapter shall apply to any and every lot of lime, marl or wood-ashes intended for fertilizing purposes. In addition to the requirements of section twelve, the label and certificates shall truly state the minimum and maximum percentage of total lime (calcium oxide),

the minimum and maximum percentage of total magnesia (magnesium oxide), the minimum and maximum percentage of lime combined as carbonate (calcium carbonate), and magnesium combined as carbonate (magnesium carbonate), and minimum percentage of lime sulphur (calcium sulphate) in gypsum or land plaster. The person filing the certificate shall annually pay to the commissioner of agriculture a registration fee of ten dollars for each brand of lime intended for fertilizing purposes.

Sec. 14. (Amended by Public Laws of 1933, Chapter 156.) Sale and manufacture of commercial fertilizer, regulated; registration fee. Any person who shall manufacture, sell, distribute, transport, offer or expose for sale, distribution or transportation in the state any commercial fertilizer shall before so doing file with the commissioner of agriculture for each and every fertilizer bearing a distinguishing name or trade-mark, a certified copy of the statements named in section twelve. Said certified copy shall also contain a definite statement relative to the minimum percentage of nitrogen contained in the fertilizer guaranteed and registered. It shall state specifically the percentage of nitrogen present in the form of organic nitrogen, the percentage present in the form of mineral chemicals such as nitrates, and the percentage present as ammonium salts. Said certified copy shall be accompanied when said commissioner shall so request with a sealed package containing not less than two pounds of the commercial fertilizer. The person who shall file said certificate shall pay annually to the commissioner of agriculture a registration fee as follows: Ten dollars each for the nitrogen and the phosphoric acid and five dollars each for the potash and magnesium, contained or said to be contained in the fertilizer, this fee to be assessed on any brand offered for sale, distribution or transportation in the state. Whenever any person shall have filed said certificate and paid said registration fee, no other person shall be required to file such statement or pay such fee.

Sec. 17. Registration may be refused when name or trade-mark is misleading. The commissioner of agriculture may refuse to register any commercial fertilizer, bearing a name, brand or trade-mark which is misleading or deceptive or which would tend to mislead or deceive as to materials of which it is composed. He may also cancel the registration of any commercial fertilizer, that he deems to be manufactured, sold, distributed, transported, offered or exposed for sale, distribution or transportation in violation of any of the provisions of this chapter. The registration of each brand of commercial fertilizer shall terminate on the thirty-first day of December of each year.

Sec. 18. For the purpose of this chapter an article shall be deemed to be adulterated; in the case of commercial fertilizers:

First. If its weight, composition, quality, strength or purity do not conform in each particular to the claims made upon the affixed guaranty.

Second. If it contains any material deleterious to growing plants.

Third. If it is found to contain any pulverized leather, hair, ground hoofs, horns, wool waste, peat garbage tankage, cyanamid, or any nitrogenous ingredients derived from any inert material whatsoever, unless the same has been so treated as to be available as plant food as determined by the

methods adopted by the association of official agricultural chemists, without an explicit printed statement of the fact, conspicuously affixed to the package of such fertilizer and accompanying and going with every lot or package of the same, in which fertilizer the above named materials aid in making up the required or guaranteed analysis.

Sec. 19. Term "misbranded" defined. The term "misbranded" as used herein, shall apply to all articles of commercial fertilizer the package or label of which shall bear any statement, design, or device regarding such article, or the ingredients or substances contained therein which shall be false or misleading in any particular, or which is falsely branded in any particular.

For the purpose of this chapter an article shall also be deemed to be misbranded:

In the case of commercial fertilizer:

First. If any package fail to bear all the statements required by section twelve.

Second. If the contents of the package as originally put up be affixed to the package differ from the statement required by section fourteen.

Third. If any brand is manufactured, distributed, transported, sold, offered or exposed for sale, distribution, or transportation upon which the registration fee required by section 14 has not been paid.

Sec. 30. Annual analysis; results of analyses to be published. The director of the Maine Agricultural Experiment Station shall annually analyze, or cause to be analyzed, samples of commercial fertilizer, at such time and to such extent as the commissioner of agriculture may determine. And said commissioner, in person or by deputy, shall have free access, ingress and egress at all reasonable hours to any place or any building wherein articles of commercial fertilizer are manufactured, stored, transported, sold, offered or exposed for sale. He may also, in person or by deputy, open any case, package or other container, and may, upon tendering the market price take samples for analysis. The results of all analyses of articles of commercial fertilizer made by said director shall be published by him in the bulletins or reports of the experiment stations, together with the names of the persons from whom the samples were obtained, the names of the manufacturers thereof and such additional information as to him may seem advisable.

Sec. 35. Certificates signed by director, presumptive evidence. Every certificate duly signed and acknowledged by the director of the Maine Agricultural Experiment Station relating to the collection and analysis of any sample of commercial fertilizer shall be presumptive evidence of the facts therein stated.

Sec. 36. No person shall adulterate or misbrand within the meaning of this chapter any commercial fertilizer or manufacture, sell, distribute, transport, offer or expose for sale, distribution, or transportation any article of commercial fertilizer in violation of any provisions of this chapter. Whoever violates said provisions shall be punished by a fine not exceeding one hundred dollars for the first offense, and by a fine not exceeding two hundred dollars for each subsequent offense.

DEPARTMENT OF AGRICULTURE

Division of Inspection

To Fertilizer Manufacturers:

In accordance with the authority granted under section sixty-five of chapter forty-one, of the revised statutes of 1930, the following rules and regulations for fertilizer registration and control within the State of Maine are herewith promulgated.

Trade or brand names shall include the formula grade in terms, and order of nitrogen, available phosphoric acid, total phosphoric acid, and water soluble potash. Applications for registration of mixed fertilizers shall include only the minimum percentage of nitrogen available for plant food, available phosphoric acid, total phosphoric acid, and water soluble potash, and all sacks or containers, or guarantees attached to sacks and containers, shall be labelled accordingly.

The statement of grade as well as the guaranteed analysis indicating the minimum percentages of available nitrogen, available phosphoric acid, and water soluble potash, shall be expressed in whole numbers.

These rules and regulations are to become effective January 1, 1932, and are hereby adopted, and I have today signed them with my hand and affixed the Seal of the Department of Agriculture.

F. P. WASHBURN,

Commissioner of Agriculture

DEPARTMENT OF AGRICULTURE

Division of Inspection

To Fertilizer Manufacturers:

In accordance with the authority granted under section sixty-five of chapter forty-one, of the revised statutes of 1930, the following rules and regulations for fertilizer registration and control within the State of Maine are herewith promulgated.

There are certain new features of registration that should be observed. Under the Public Laws of 1933, Chapter 156, it is provided that embodied in the manufacturer's certificate there shall be a definite statement regarding the nitrogen guarantee. It requires that a specific statement shall be made with reference to nitrogen requiring that there shall be expressed definitely and specifically the percentage of nitrogen present in the form of organic nitrogen, and in the form of mineral chemicals such as nitrates, and the percentage of nitrogen present in form of ammonium salts.

It is to be understood, however, that the special statement as to the kind of nitrogen is not required on the fertilizer package, but is definitely required in the manufacturer's certificate.

Another item that should be observed is with reference to a guarantee of magnesium oxide. Any manufacturer of fertilizer who chooses to introduce magnesia in commercial fertilizer should make a statement as to the guarantee of magnesium oxide in the manufacturer's certificate, and the guarantee

for magnesium oxide should be made either on a separate tag in type of at least one quarter inch high, or be stamped on the bag with letters at least one-half inch high, and we suggest that this legend should be located at right angles with the guarantee of nitrogen, phosphoric acid and potassium oxide.

These rules and regulations are to become effective January 1, 1934, and are hereby adopted, and I have today signed them with my hand and affixed the Seal of the Department of Agriculture.

F. P. WASHBURN,
Commissioner of Agriculture

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November, 1944

MAINE
AGRICULTURAL EXPERIMENT STATION
ORONO, MAINE

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Official Inspections

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COMMERCIAL AGRICULTURAL SEEDS, 1944
FUNGICIDES AND INSECTICIDES, 1944

The Commissioner of Agriculture is the executive of the law regulating the sale of agricultural seeds, fungicides and insecticides in Maine. It is the duty of the Director of the Maine Agricultural Experiment Station to make or to cause to have made, the analyses of the samples collected by the Commissioner, and to publish the results of the analyses together with such additional information as may seem advisable.

NOTE: All correspondence relative to the inspection laws and requests for copies of the laws should be addressed to the Division of Inspection, Department of Agriculture, Augusta, Maine.

*On leave of absence. Military service.

COMMERCIAL AGRICULTURAL SEEDS, 1944

GEORGE P. STEINBAUER

THE PURPOSE AND SIGNIFICANCE OF SEED TESTING

The yield of crops propagated from seed is dependent first upon the quality of the seed planted and second upon the conditions prevailing during the growing season. It is the aim of seed testing to give advance information, in as far as possible, about the potential plant-producing capacity of seed stocks before they are planted. Such information should include the per cent germination and per cent purity as well as the kind and number of noxious weed seeds present.

In order to safeguard the purchaser of seeds as well as the reliable seed dealer, various laws have been passed regulating the proper labeling of seeds offered for public sale.

THE LAW REGULATING THE SALE OF AGRICULTURAL SEEDS

The first law regulating the sale of agricultural seeds was enacted by the Legislature of 1897. This has been revised by the Legislatures of 1905, 1911, and 1919. The following are the sections of the greatest importance to the dealer and the user of seeds. The most important changes made by the Legislature of 1919 are the declaration of noxious seeds and the vitality or germination guaranty required under section 3. As provided for under the inspection law, the Commissioner of Agriculture has proclaimed a list of seeds that will for the present be considered as noxious. This list is given on page 90.

Section 2. The term "agricultural seed" as used in this chapter shall be held to include the seeds of alfalfa, barley, Canadian blue grass, Kentucky blue grass, brome grass, buckwheat, alsike clover, crimson clover, red clover, medium clover, white clover, field corn, Kaffir corn, meadow fescue, flax, millet, oats, orchard grass, rape, redtop, rye, sorghum, timothy, and wheat.

Section 3. Every lot or package of agricultural seed which is sold, distributed, transported, offered or exposed for sale, distribution or transportation for seed, in the state by any dealer in seed shall have affixed in a conspicuous place on the outside thereof, a plainly written or printed statement

clearly and truly giving the name thereof and its minimum percentage of purity and freedom from foreign matter, together with the name and approximate amount of each kind of noxious weed seed contained therein, and also a guaranty of the germinating power of the seed and the date of the test for germination.

Section 12. For the purpose of this chapter an article shall be deemed to be adulterated:

In case of agricultural seed:

First. If its purity falls below its accompanying guaranty.

Second. If it contains the seed of any poisonous plant, or any kind or amount of weed seed other than the kinds or amounts represented in the statement required by section three of this chapter.

Third. If it, upon test of germination made within six months of the date of test in statement under the provisions of section three herein above, does not show the same germinating power given in said statement prescribed by the provision of said section three. Provided said seed has been constantly kept under conditions not injurious to its germinating qualities, and that a margin of tolerance of five per cent shall be allowed.

List of Noxious Weed Seeds Arranged Alphabetically by Scientific Names. (Gray's Manual, 7th Edition, 1908)

Agropyron repens. Witch Grass.
Agrostemma githago. Corn Cockle.
Ambrosia artemisiifolia. Common Ragweed.
Ambrosia psilostachya. Perennial Ragweed.
Ambrosia trifida. Great Ragweed.
Avena fatua. Wild Oats.
Brassica arvensis. Charlock
Brassica campestris. Rutabaga.
Brassica juncea. Indian Mustard.
Brassica nigra. Black Mustard.
Camelina microcarpa. Small Seeded False Flax.
Camelina sativa. False Flax.
Chrysanthemum leucanthemum. Ox-eye Daisy.
Cichorium intybus. Chicory.
Cirsium arvense. Canada Thistle.
Conringia orientalis. Hare's-Ear Mustard.
Convolvulus arvensis. Field Bindweed.
Cuscuta species. Dodder.
Daucus carota. Wild Carrot.
Echium vulgare. Blueweed.
Erigeron annuus. Sweet Scabious.
Erigeron ramosus. Daisy Fleabane.
Hieracium aurantiacum. Orange Hawk Weed.
Hieracium pratense. King Devil Weed.
Lappula echinata. Blue Bur or Stickseed.
Lychnis alba. White Campion.
Lolium temulentum. Bearded Darnel.
Neslia paniculata. Ball Mustard.
Plantago lanceolata. Ribgrass.
Raphanus raphanistrum. Wild Radish.
Rumex conglomeratus. Clustered Dock.
Rumex crispus. Yellow Dock.
Rumex obtusifolius. Bitter Dock.
Saponaria vaccaria. Cow-herb.
Silene latifolia. Bladder Campion.
Silene noctiflora. Night-flowering Catchfly.
Sisymbrium altissimum. Tumble Mustard.
Sonchus asper. Spiny-leaved or Prickly Sow Thistle.
Sonchus arvensis. Field (Perennial) Sow Thistle.
Sonchus oleraceus. Common (Annual) Sow Thistle.
Thlaspi arvense. Field Penny Cress.

The following pages give the results of analyses of 136 samples of agricultural seeds collected on the wholesale and retail market during 1944. Credit for the analytical work reported in this publication is due to George P. Steinbauer, Seed Analyst, and Joanne M. Goodline, Technical Assistant; for the compilation of the results of analyses to Rose H. McGuigan, Stenographer.

EXPLANATION OF TABLES

The seeds tested are arranged alphabetically by their common names. The first column in the tables gives the Station numbers of the sample, the second and third columns the names of the wholesale and retail dealers, and the fourth column the seedman's lot number or trade brand. The next five columns give the per cent of pure seed, weed seed, inert matter, germination and "hard seeds." The term "hard seeds" refers to those seeds which fail to absorb moisture and remain hard at the end of the germination test. Many of these "hard seeds" may eventually germinate and produce plants. Due to the fact that the actual plant producing power of these hard seeds is variable, the per cent of hard seeds cannot be included in the per cent germination. The latter refers only to the actual per cent of strong sprouts produced during the laboratory test period. The last two columns give the date of germination tests and the number of noxious weed seeds per pound.

The majority of the samples tested showed close agreement between the per cent of germination and per cent purity as given on the label and as found in the laboratory. The greatest differences between the guaranties on the label and results obtained in the laboratory were relative to the noxious weed seed content. In several instances a large number of noxious weed seeds were found per pound of seed but were not reported on the label. It will be noted that certain crop seeds such as corn, soybeans, and cereals seldom have many noxious weed seeds in them. Others are more likely to have impurities in them and need to be examined more carefully when seed stocks are being purchased.

Results of Examination of Official Seed Samples, 1944

Station number	Seed Company	Dealer	Seedman's Lot No. or Brand	Percentage				Date of Germination test	Noxious weeds, Common name and number per pound
				Pure seed	Weed seeds	Inert matter	Germination		
		ALFALFA							
14646	Stanford Seed Co., Inc., Buffalo, N. Y.	Allen, Sterling & Lothrop, Portland, Me.	2347 G* F*	99.40 99.04	0.20 0.32	0.35 0.44	63.00 61.00	Jan. 1944 Apr. 1944	-----
14655	J. Chas. McCullough Seed Co., Cincinnati, O.	Allen, Sterling & Lothrop, Portland, Me.	5981 G F	99.26 98.80	0.02 0.09	0.72 1.10	86.00 81.00	Feb. 1944 Apr. 1944	-----
		BARLEY							
14640	Stanford Seed Co., Inc., Buffalo, N. Y.	Allen, Sterling & Lothrop, Portland, Me.	5574 G F	99.46 99.65	0.04 0.04	0.40 0.19	92.00 93.00	Jan. 1944 May 1944	----- Wild oats 5
14658	J. Chas. McCullough Seed Co., Cincinnati, O.	Allen, Sterling & Lothrop, Portland, Me.	6407 G F	99.00 99.26	0.10 0.12	0.65 0.17	90.00 88.00	Feb. 1944 May 1944	----- Wild oats 5, Penny cross 5, Charlock 162
14673	Arthur R. Cone, Buffalo, N. Y.	Biddeford-Saco Grain Co., Biddeford, Me.	35 372 G F	98.25 98.47	0.10 —	1.15 0.33	93.00 91.00	Nov. 1943 Aug. 1944	-----
14770	Eastern States Farmers' Exchange, West Springfield, Mass.	Eastern States Farmers' Exchange, Presque Isle, Me.	1121 G F	99.25 99.40	0.10 —	0.15 0.54	90.00 83.00	Mar. 1944 June 1944	-----
14728	Chas. M. Cox Co., Boston, Mass.	Piper's Feed Mill, Norridgeawock, Me.	— G F	93.00 99.50	0.50 —	0.50 0.04	92.00 88.00	Apr. 1944 June 1944	----- Wild oats 6, Charlock 6
14750	The Belt Seed Co., Baltimore, Md.	John Watson Co., Houlton, Me.	2946 G F	98.00 99.21	0.25 0.07	1.75 0.40	90.00 93.00	Mar. 1944 June 1944	----- Wild oats 35, Charlock 18

* These letters indicate respectively given on the guaranty and found by the laboratory test.

Results of Examination of Official Seed Samples, 1944

Station number	Seed Company	Dealer	Seedman's Lot No. or Brand	Percentage				Date of Germination test	Noxious weeds, Common name and number per pound
				Pure seed	Weed seeds	Inert matter	Hard nation seeds		
14777	F. H. Woodruff & Sons, Milford, Conn.	BENT GRASS Rice & Miller Co., Bangor, Me.	94-216 G* F*	97.13 0.04 93.25 0.10	2.79 92.00 3.65 88.00	— — — —	— — — —	Dec. 1943 June 1944	— — — —
14651	J. Chas. McCullough Seed Co., Cincinnati, O.	BLUEGRASS, Kentucky Allen, Sterling & Lothrop, Portland, Me.	5619 G F	85.22 0.17 87.22 0.50	14.59 80.30 12.28 88.00	— — — —	— — — —	Dec. 1943 Apr. 1944	— — — —
14676	Arthur R. Cone, Buffalo, N. Y.	Biddeford-Saco Grain Co., Biddeford, Me.	34-92 G F	89.60 0.10 87.22 0.20	10.25 89.00 12.58 81.00	— — — —	— — — —	Dec. 1943 May 1944	— — — —
14636	Albert Dickinson Co., Chicago, Ill.	R. B. Dunning & Co., Bangor, Me.	032108 G F	88.30 0.20 89.74 —	11.20 81.00 10.23 87.00	— — — —	— — — —	Jan. 1944 Apr. 1944	— — — —
14736	Eastern States Farmers' Exchange, West Springfield, Mass.	Eastern States Farmers' Exchange, Skowhegan, Me.	1099 G F	90.40 0.40 90.12 0.29	9.00 75.00 8.91 70.00	— — — —	— — — —	Dec. 1943 May 1944	— — — —
14743	Whitney Seed Co., Inc., Buffalo, N. Y.	Morrill's Coal & Grain Co., Portland, Me.	136716 G F	98.20 0.30 99.06 —	1.10 85.00 0.94 81.00	— — — —	— — — —	Jan. 1944 May 1944	— — — —
14776	F. H. Woodruff & Sons, Milford, Conn.	Rice & Miller Co., Bangor, Me.	50-238 G F	87.42 0.49 91.56 0.10	11.99 86.50 9.34 84.00	— — — —	— — — —	Mar. 1944 Sept. 1944	— — — —
14709	Whitney Seed Co., Inc., Buffalo, N. Y.	BUCKWHEAT Burbank Seed Co., Portland, Me.	8123 G F	99.38 0.01 99.05 —	0.55 94.00 0.30 93.00	— — — —	— — — —	Mar. 1944 June 1944	— — — —

* These letters indicate respectively given on the guaranty and found by the laboratory test.

Results of Examination of Official Seed Samples, 1944

Station number	Seed Company	Dealer	Seedman's Lot No.	Percentage				Date of Germination test	Noxious weeds, Common name and number per pound
				Pure seed	Weed seeds	Inert matter	Germination		
14726	Whitney Seed Co., Inc., Buffalo, N. Y.	Checkerboard Feed Store, Skowhegan, Me.	8123	G* 99.38 F* 99.78	0.01 0.01	0.55 0.13	94.00 95.00	Mar. 1944 June 1944	Common ragweed 9
14700	Eastern States Farmers' Exchange, West Springfield, Mass.	Eastern States Farmers' Exchange, Auburn, Me.	1198	G 99.00 F 99.93	0.10 —	0.55 0.04	87.00 84.00	Feb. 1944 June 1944	-----
14682	Arthur R. Cone, Buffalo, N. Y.	Farm Service Store, Biddeford, Me.	65-138	G 98.50 F 99.07	0.85 0.20	0.65 0.68	90.00 90.00	Feb. 1944 June 1944	Common ragweed 207
14721	Stanford Seed Co., Inc., Buffalo, N. Y.	Piper's Feed Mill, Norridgewock, Me.	5479	G 99.80 F 99.98	0.00 —	0.14 0.02	89.00 89.00	Feb. 1944 June 1944	-----
CLOVER, Alsike									
14758	The Belt Seed Co., Baltimore, Md.	Geo. E. Buck, Caribou, Me.	809	G 98.00 F 97.20	— 0.45	0.75 1.50	70.00 67.00	Mar. 1944 July 1944	Bladder campion 54, Night-flowering catchfly 432, Yellow dock 64, Ribgrass 90
14705	Wentheimer-McGuinn Seed Co., Digoulet, Ind.	Louis A. Cyr, Limestone, Me.	43101	G 98.10 F 97.60	0.19 0.75	0.49 0.45	82.00 84.00	Mar. 1944 June 1944	Ribgrass 2194, Night-flowering catchfly 63
14694	Eastern States Farmers' Exchange, West Springfield, Mass.	Eastern States Farmers' Exchange, Auburn, Me.	73	G 99.25 F 98.45	0.15 0.70	0.35 0.15	75.00 82.00	Jan. 1944 May 1944	Small-seeded false flax 27, Yellow dock 117, Canada thistle 9
14747	Allied Seed Co., Fort Wayne, Ind.	Geo. A. Hall Co., Houlton, Me.	B3107	G 99.00 F 98.55	0.10 0.30	0.25 0.65	87.00 88.00	Jan. 1944 June 1944	-----

* These letters indicate respectively given on the guaranty and found by the laboratory test.

Results of Examination of Official Seed Samples, 1944

Station number	Seed Company	Dealer	Seedman's Lot No. or Brand	Percentage					Date of Germination test	Noxious weeds. Common name and number per pound
				Pure seed	Weed seeds	Inert matter	Germination	Hard seeds		
14712	Stanford Seed Co., Inc., Buffalo, N. Y.	Merrill & Mayo, Inc., Waterville, Me.	5698 F*	G* 98.00 F* 98.60	0.30 0.35	0.37 0.35	80.00 82.00	11.00 5.00	Feb. 1944 June 1944	Bladder campion 9, Rib- grass 90, Yellow dock 180, False flax 36
14774	F. H. Woodruff & Sons, Milford, Conn.	Rice & Miller Co., Bangor, Me.	85-211 F	G 96.38 F 98.05	0.00 0.15	0.34 0.40	71.00 32.00	10.00 3.00	Dec. 1943 July 1944	Ribgrass 189
14760	The Belt Seed Co., Baltimore, Md.	John Watson Co., Fort Fairfield, Me.	817 F	G 98.00 F 96.74	0.50 2.41	1.50 0.35	70.00 89.00	20.00 3.00	Mar. 1944 June 1944	Ribgrass 873, Canada thistle 9, Yellow dock 9
14761	T. W. Wood & Sons, Richmond, Va.	John Watson Co., Fort Fairfield, Me.	301 F	G 99.25 F 99.50	0.10 0.10	0.40 0.40	70.00 73.00	20.00 13.00	Dec. 1943 June 1944	Small-seeded false flax 9
14738	Whitney Seed Co., Inc., Buffalo, N. Y.	Webber Grain & Feed Co., Yarmouth, Me.	15519 F	G 98.10 F 99.20	0.34 0.20	0.40 0.35	80.00 89.50	12.00 —	Apr. 1944 June 1944	Canada thistle 63, Rib- grass 27, Yellow dock 171, False flax 36
14756	The Belt Seed Co., Baltimore, Md.	York & Fenderson, Mars Hill, Me.	803 F	G 99.23 F 99.25	0.35 0.40	0.37 0.25	80.00 82.00	10.00 10.00	Mar. 1944 July 1944	Ribgrass 90, Yellow dock 27
14767	Eastern States Farmers' Exchange, West Springfield, Mass.	CLOVER, Crimson Eastern States Farmers' Exchange, Presque Isle, Me.		1096 F	99.60 99.50	0.10 —	87.00 85.00	3.00 0.50	Dec. 1943 June 1944	Rutabaga 18, Common ragweed 9
14749	Duryea Seed Co., Inc., New York, N. Y.	Geo. A. Hall Co., Houlton, Me.	17-45 F	G 99.00 F 99.48	0.15 0.12	0.20 0.40	80.00 76.00	— 0.75	Dec. 1943 June 1944	Rutabaga 180, Yellow dock 9

* These letters indicate respectively given on the guaranty and found by the laboratory test.

Results of Examination of Official Seed Samples, 1944

Station number	Seed Company	Dealer	Seedman's Lot No. or Brand	Percentage				Date of Germination test	Noxious weeds, name and number per pound
				Pure seed	Weed seeds	Inert matter	Germination seeds		
14753	Whitney Seed Co., Inc., Buffalo, N. Y.	A. M. Stackpole Co., Bridgewater, Me.	5751	G* 99.36 F* 99.74	0.01 0.10	0.52 0.16	83.00 73.00	Mar. 1944 July 1944	Rutabaga 1170, Yellow dock 9
14751	The Belt Seed Co., Baltimore, Md.	John Watson Co., Houlton, Me.	2471	G 99.00 F 99.04	0.55 0.10	0.45 0.24	70.00 75.00	Mar. 1944 June 1944	Rutabaga 72, Indian mustard 54
		CLOVER, Ladino							
14056	J. Chas. McCullough Seed Co., Cincinnati, O.	Allen, Sterling & Lothrop, Portland, Me.	6049	G 99.50 F 99.55	0.05 0.05	0.45 0.25	86.00 74.00	Jan. 1944 Apr. 1944	Ribgrass 63
14674	Arthur R. Cone, Buffalo, N. Y.	Biddeford-Saco Grain Co., Biddeford, Me.	100-503	G 99.10 F 98.75	0.10 0.69	0.60 0.65	74.00 92.00	Mar. 1944 May 1944	Ribgrass 486, Yellow dock 72
14724	Whitney Seed Co., Inc., Buffalo, N. Y.	Checkerboard Feed Store, Skowhegan, Me.	56L36	G 96.80 F 96.20	0.50 0.75	0.30 0.25	69.00 73.00	Mar. 1944 July 1944	
14697	Eastern States Farmers' Exchange, West Springfield, Mass.	Eastern States Farmers' Exchange, Auburn, Me.	195	G 99.30 F 99.25	0.10 0.25	0.35 0.25	60.00 89.00	Mar. 1944 May 1944	Ribgrass 306, Yellow dock 9
14090	Stanford Seed Co., Inc., Buffalo, N. Y.	Scribner Grain Co., Brunswick, Me.	5720	G 99.00 F 99.20	0.17 0.35	0.37 0.20	85.00 89.00	Feb. 1944 May 1944	Ribgrass 198, Bladder campion 9, Rutabaga 9, Yellow dock 30
14708	Albert Dickinson Co., Chicago, Ill.	South Paris Farmers Union, South Paris, Me.	25508	G 98.25 F 98.35	0.25 0.25	0.10 0.20	90.00 65.00	Feb. 1944 May 1944	

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Results of Examination of Official Seed Samples, 1944

Station number	Seed Company	Dealer	Seedman's Lot No. or Brand	Percentage				Date of Germination test	Noxious weeds, name and number per pound
				Pure seed	Weed seeds	Inert matter	Germination		
14762	The Belt Seed Co., Baltimore, Md.	John Watson Co., Fort Fairfield, Me.	1703	G* 98.00 F* 99.45	0.25	0.75 0.45	60.00 72.00	Mar. 1944 June 1944	----- -----
14757	Whitney Seed Co., Inc., Buffalo, N. Y.	CLOVER, Mammoth Edmund Beaujeu, Presque Isle, Me.	5153	G 99.08 F 99.23	0.16 0.08	0.38 0.64	72.00 71.00	Apr. 1944 July 1944	----- Ribgrass 81, Canada thistle 9
14768	Eastern States Farmers' Exchange, West Springfield, Mass.	Eastern States Farmers' Exchange, Presque Isle, Me.	1105	G 99.40 F 99.64	0.12 —	0.28 0.22	80.00 75.00	Dec. 1943 July 1944	----- Ribgrass 27, Yellow dock 9
14745	Allied Seed Co., Fort Wayne, Ind.	Geo. A. Hall Co., Houlton, Me.	B5700	G 99.50 F 99.44	0.10 0.10	0.08 0.30	86.00 89.00	Jan. 1944 June 1944	----- Yellow dock 9
14752	Wertheimer-McGuinn Seed Co., Ligonier, Ind.	Houlton Grange Store, Houlton, Me.	48200	G 99.00 F 99.82	0.10 0.18	0.08 —	93.00 88.00	Oct. 1943 June 1944	----- Ribgrass 171, Canada thistle 9
14763	The Belt Seed Co., Baltimore, Md.	John Watson Co., Fort Fairfield, Me.	949	G 99.00 F 99.21	0.50 0.24	0.50 0.32	60.00 64.00	Mar. 1944 June 1944	----- Ribgrass 162, Yellow dock 54, Bladder campion 18
14642	J. Chas. McCullough Seed Co., Cincinnati, O.	CLOVER, Medium Red Allen, Sterling & Lothrop, Portland, Me.	5878	G 99.30 F 99.98	0.04 0.02	0.08 —	80.00 75.00	Jan. 1944 Apr. 1944	----- -----
14672	Arthur R. Cone, Buffalo, N. Y.	Biddeford-Saco Grain Co., Biddeford, Me.	15-484	G 99.11 F 98.64	0.75 0.68	0.07 0.00	82.00 79.00	Feb. 1944 May 1944	----- Ribgrass 234, Chicory 45, Common ragweed 36

* These letters indicate respectively given on the guaranty and found by the laboratory test.

Results of Examination of Official Seed Samples, 1944

Station number	Seed Company	Dealer	Seedman's Lot No. or Brand	Percentage					Date of Germination test	Noxious weeds, Common name and number per pound
				Pure seed	Weed seeds	Inert matter	Germination	Hard seeds		
14766	Wertheimer-McGunn Seed Co., Ligonier, Ind.	Louis A. Cyr, Limestone, Me.	36	G* 96.00 F* 96.62	0.15 0.06	0.07 0.10	90.00 85.00	— 5.00	Jan. 1944 Aug. 1944	Canada thistle 18, Rib-grass 117, Night-flowering catchfly 234, Yellow dock 90
14695	Eastern States Farmers' Exchange, West Springfield, Mass.	Eastern States Farmers' Exchange, Auburn, Me.	1117	G 96.40 F 96.34	0.10 0.10	0.15 0.26	85.00 90.00	7.00 8.00	Dec. 1943 May 1944	Yellow dock 135, Bladder campion 90, Ribgrass 9
14703	Arthur B. Cone, Buffalo, N. Y.	Farm Service Store, Auburn, Me.	15-472	G 96.05 F 96.66	0.43 0.66	0.13 0.40	72.00 84.00	16.00 5.00	Jan. 1944 May 1944	Hulled ragweed 90, Rib-grass 284, Yellow dock 45
14746	Allied Seed Co., Fort Wayne, Ind.	Geo. A. Hall Co., Houlton, Me.	B5706	G 96.50 F 96.12	0.16 0.62	0.14 0.84	86.00 83.00	5.00 4.00	Jan. 1944 June 1944	Ribgrass 27
14720	Wertheimer-McGunn Seed Co., Ligonier, Ind.	Walter H. Ray, Anson, Me.	36	G 94.00 F 94.39	0.15 5.17	0.07 0.16	90.00 67.00	— 1.60	Jan. 1944 June 1944	Ribgrass 345, Canada thistle 45, Common ragweed 45, Bladder campion 90
14775	F. H. Woodruff & Sons, Milford, Conn.	Rice & Miller Co., Bangor, Me.	87-220	G 97.22 F 96.90	1.40 2.00	0.94 0.80	77.50 73.00	3.00	Feb. 1944 June 1944	Yellow dock 9, Chicory 27, Ribgrass 27
14691	Stanford Seed Co., Inc., Buffalo, N. Y.	Scribner Grain Co., Brunswick, Me.	6173	G 99.50 F 99.20	0.08 0.30	0.20 0.26	94.00 94.00	2.00 1.00	Mar. 1944 May 1944	Yellow dock 9
14739	Whitney Seed Co., Inc., Buffalo, N. Y.	Webber Grain & Feed Co., Yarmouth, Me.	5059	G 99.11 F 99.04	0.21 0.22	0.19 0.58	87.00 85.00	5.00 5.00	Apr. 1944 June 1944	Ribgrass 351, Yellow dock 10

* These letters indicate respectively given on the guaranty and found by the laboratory test.

Results of Examination of Official Seed Samples, 1944

Station number	Seed Company	Dealer	Seedman's Lot No.	Percentage				Date of germination test	Noxious weeds, Common name and number per pound
				Pure seed	Weed seeds	Inert matter	Germination		
14754	The Belt Seed Co., Baltimore, Md.	York & Fenderson, Mars Hill, Me.	166	G* 99.38 F* 98.99	0.03 0.09	0.10 0.68	71.00 78.00	Feb. 1944 July 1944	-----
14711	Whitney Seed Co., Inc., Buffalo, N. Y.	CLOVER, White Burbank Seed Co., Portland, Me.	56W31	G 98.80 F 98.55	0.15 1.40	0.23 0.05	90.00 91.00	Mar. 1944 May 1944	----- Ribgrass 81, Bladder campion 108
14847	Stanford Seed Co., Inc., Buffalo, N. Y.	CORN Allen, Sterling & Lothrop, Portland, Me.	2644	G 99.00 F 99.70	0.00 —	1.00 0.30	90.00 80.00	Mar. 1944 May 1944	-----
14648	Stanford Seed Co., Inc., Buffalo, N. Y.	Allen, Sterling & Lothrop, Portland, Me.	5471	G 99.00 F 99.50	0.00 —	1.00 0.80	85.00 74.00	Mar. 1944 May 1944	-----
14671	Arthur R. Cone, Buffalo, N. Y.	Biddeford-Saco Grain Co., Biddeford, Me.	88-198	G 99.50 F 99.90	— —	0.40 0.10	90.00 81.00	Feb. 1944 June 1944	-----
14679	Arthur R. Cone, Buffalo, N. Y.	Biddeford-Saco Grain Co., Biddeford, Me.	80-943	G 99.50 F 99.98	— —	0.40 0.02	90.00 87.00	Mar. 1944 June 1944	-----
14772	Stanford Seed Co., Inc., Buffalo, N. Y.	H. A. Dunning & Son, Bangor, Me.	281	G 99.00 F 99.39	0.00 —	1.00 0.61	85.00 83.00	Mar. 1944 June 1944	-----
14729	Eastern States Farmers' Exchange, West Springfield, Mass.	Eastern States Farmers' Exchange, Skowhegan, Me.	98	G 99.25 F 99.23	0.00 —	0.75 0.77	95.00 99.00	Feb. 1944 June 1944	-----

* These letters indicate respectively given on the guaranty and found by the laboratory test.

Results of Examination of Official Seed Samples, 1944

Station number	Seed Company	Dealer	Seedman's Lot No.	Percentage				Date of Germination test	Noxious weeds, name and number per pound
				Pure seed	Weed seeds	Inert matter	Germination		
14732	Eastern States Farmers' Exchange, West Springfield, Mass.	Eastern States Farmers' Exchange, Skowhegan, Me.	999	G* 99.25 F* 99.73	0.00	0.75 0.27	95.00 96.00	Dec. 1943 June 1944	-----
14733	Eastern States Farmers' Exchange, West Springfield, Mass.	Eastern States Farmers' Exchange, Skowhegan, Me.	1093	G 99.25 F 99.80	0.00	0.75 0.20	95.00 98.00	Dec. 1943 June 1944	-----
14734	Eastern States Farmers' Exchange, West Springfield, Mass.	Eastern States Farmers' Exchange, Skowhegan, Me.	1142	G 99.25 F 98.85	0.00	0.75 1.15	90.00 94.00	Feb. 1944 June 1944	-----
14683	Arthur R. Cone, Buffalo, N. Y.	Farm Service Store, Biddeford, Me.	80-H-72	G 99.50 F 99.22	—	0.40 0.78	92.00 98.00	Feb. 1944 June 1944	-----
14684	Arthur R. Cone, Buffalo, N. Y.	Farm Service Store, Biddeford, Me.	80-916	G 99.50 F 99.90	—	0.40 0.10	90.00 89.00	Feb. 1944 June 1944	-----
14713	T. W. Wood & Sons, Richmond, Va.	Merrill & Mayo, Inc., Waterville, Me.	701	G 99.00 F 99.50	0.00	1.00 0.50	90.00 88.00	Feb. 1944 June 1944	-----
14714	T. W. Wood & Sons, Richmond, Va.	Merrill & Mayo, Inc., Waterville, Me.	1655	G 99.00 F 99.53	—	1.00 0.47	90.00 98.00	Jan. 1944 June 1944	-----
14741	Whitney Seed Co., Inc., Buffalo, N. Y.	Morrill's Coal & Grain Co., Portland, Me.	7052	G 99.00 F 99.95	0.00	1.00 0.05	85.00 99.00	Feb. 1944 June 1944	-----
14742	Whitney Seed Co., Inc., Buffalo, N. Y.	Morrill's Coal & Grain Co., Portland, Me.	70336	G 99.00 F 99.64	0.00	1.00 0.36	90.00 88.00	Apr. 1944 June 1944	-----

* These letters indicate respectively given on the guaranty and found by the laboratory test.

Results of Examination of Official Seed Samples, 1944

Station number	Seed Company	Dealer	Seedman's Lot No.	Percentage			Date of germination test	Noxious weeds, Common name and number per pound
				Pure seed	Inert matter	Hard nation seeds		
14631†	J. Chas. McCullough Seed Co., Cincinnati, O.	FESCUE Allen, Sterling & Lothrop, Portland, Me.	5224	G* 97.05	0.19	—	Jan. 1944	—
				F* 99.54	0.21	—	May 1944	—
14677†	Arthur R. Cone, Buffalo, N. Y.	Biddeford-Saco Grain Co., Biddeford, Me.	100-457	G 99.05	0.03	—	Dec. 1943	—
				F 99.23	0.21	—	May 1944	—
14727	Whitney Seed Co., Inc., Buffalo, N. Y.	GRASS MIXTURE Checkerboard Feed Store, Skowhegan, Me. ° Alsike ° Timothy ° Alsike ° Timothy	1352	G 97.04°	0.45	—	Feb. 1944	—
				F 98.54°	0.25	—	July 1944	Ribgrass 9
14644	Stanford Seed Co., Inc., Buffalo, N. Y.	MILLET, Hungarian Allen, Sterling & Lothrop, Portland, Me.	2974	G 98.43	0.56	—	Dec. 1943	—
				F 99.36	0.32	—	May 1944	Common ragweed 270
14680	Whitney Seed Co., Inc., Buffalo, N. Y.	Farm Service Store, Biddeford, Me.	4853	G 98.00	0.30	—	Jan. 1944	—
				F 98.82	0.80	—	Aug. 1944	Common ragweed 27
14718	Wertheimer-McGuinn Seed Co., Ligonier, Ind.	Walter H. Ray, Anson, Me.	8394	G 98.00	1.66	—	Jan. 1944	—
				F 98.78	1.02	—	June 1944	Common ragweed 63

* These letters indicate respectively given on the guaranty and found by the laboratory test.

† Chewing Fescue.

Results of Examination of Official Seed Samples, 1944

Station number	Seed Company	Dealer	Seedman's Lot No.	Percentage				Date of Germination test	Noxious weeds. Common name and number per pound
				Pure Weed seed	Inert matter	Germination	Hard seeds		
14719	Wertheimer-McTunn Seed Co., Ligonier, Ind.	Walter H. Ray, Anson, Me.	2906	G* 98.10 F* 98.20	1.44 1.50	0.38 0.30	90.00 68.00	Dec. 1943 July 1944	Common ragweed 252
14686	Stanford Seed Co., Inc., Buffalo, N. Y.	Scribner Grain Co., Brunswick, Me.	5308	G 98.40 F 99.75	0.58 0.25	0.87 —	80.00 75.00	Jan. 1944 Aug. 1944	Common ragweed 123
		MILLET, Japanese							
14645	Stanford Seed Co., Inc., Buffalo, N. Y.	Allen, Sterling & Lothrop, Portland, Me.	5303	G 98.33 F 98.48	1.52 1.22	0.15 0.30	85.00 81.00	Dec. 1943 May 1944	Common ragweed 279
14662	J. Chas. McCullough Seed Co., Cincinnati, O.	Allen, Sterling & Lothrop, Portland, Me.	6002	G 98.25 F 99.38	1.55 0.58	0.15 0.04	90.00 93.00	Dec. 1943 May 1944	Common ragweed 207, Rutabaga 18
14725	Whitney Seed Co., Inc., Buffalo, N. Y.	Chesterboard Feed Store, Skowhegan, Me.	46-5	G 98.10 F 99.02	0.75 0.88	0.08 0.10	85.00 80.00	Mar. 1944 June 1944	Common ragweed 360
14603	Albert Dickinson Co., Chicago, Ill.	R. B. Dunning & Co., Bangor, Me.	CR194	G 98.75 F 99.09	— 0.90	1.01 0.61	86.00 87.00	Jan. 1944 May 1944	Common ragweed 270
14602	Eastern States Farmers' Exchange, West Springfield, Mass.	Eastern States Farmers' Exchange, Auburn, Me.	1097	G 99.00 F 99.33	0.90 0.67	0.10 —	85.00 82.00	Dec. 1943 June 1944	Common ragweed 378
14681	Arthur R. Cone, Buffalo, N. Y.	Farm Service Store, Biddeford, Me.	38-280	G 98.61 F 99.00	1.02 1.00	0.10 —	80.00 78.00	Dec. 1943 May 1944	Common ragweed 522
14773	F. H. Woodruff & Sons, Milford, Conn.	Rice & Miller Co., Bangor, Me.	103-20	G 99.63 F 99.26	0.04 0.10	0.26 0.44	80.00 77.00	Jan. 1944 June 1944	Common ragweed 54

* These letters indicate respectively given on the guaranty and found by the laboratory test.

Results of Examination of Official Seed Samples, 1944

Station number	Seed Company	Dealer	Seedman's Lot No. or Brand	Percentage				Date of Germination test	Noxious weeds. Common name and number per pound
				Pure seed	Weed seeds	Inert matter	Germination		
14088	Stanford Seed Co., Inc., Buffalo, N. Y.	Scribner Grain Co., Brunswick, Me.	5093 G* F*	98.33 98.16	1.52 1.80	0.15 0.04	85.00 85.00	Dec. 1943 May 1944	Common ragweed 252
14649	Stanford Seed Co., Inc., Buffalo, N. Y.	OATS Allen, Sterling & Lothrop, Portland, Me.	5721 G F	99.54 99.95	0.04 —	0.08 0.01	92.00 91.00	Mar. 1944 May 1944	----- -----
14728	Ralston Purina Co., St. Johnsbury, Vt.	Chesterboard Feed Store, Skowhegan, Me.	1 G F	97.36 96.93	0.27 0.45	0.12 0.11	91.00 69.00	Mar. 1944 July 1944	----- Wild oats 81
14705	Merrimac Farmers Exchange, Boston, Mass.	C. B. Cummings & Sons Co., Norway, Me.	— G F	98.56 98.59	0.25 0.02	— 0.32	69.00 70.00	Feb. 1944 June 1944	----- Wild oats 72, Charlock 18, Rutabaga 9, Ball mustard 9
14098	Eastern States Farmers' Exchange, West Springfield, Mass.	Eastern States Farmers' Exchange, Auburn, Me.	1137 G F	98.00 99.24	0.50 0.62	0.50 0.04	91.00 87.00	Feb. 1944 June 1944	----- Wild oats 104
14099	Eastern States Farmers' Exchange, West Springfield, Mass.	Eastern States Farmers' Exchange, Auburn, Me.	1135 G F	95.00 93.81	1.50 1.43	0.20 0.48	80.00 85.00	Jan. 1944 Aug. 1944	----- Charlock 5, Wild oats 360
14704	General Mills, Inc., Fitchburg, Mass.	Farm Service Store, Auburn, Me.	444-872 G F	98.50 98.33	0.16 0.19	0.03 0.03	90.00 93.00	Jan. 1944 June 1944	----- Charlock 13, Wild oats 23
14706	Chas. M. Cox Co., Boston, Mass.	Norway Farmers Union, Norway, Me.	— G F	99.00 99.14	0.22 0.19	0.09 0.14	84.75 81.00	Mar. 1944 June 1944	----- Wild oats 24, Charlock 10

* These letters indicate respectively given on the guaranty and found by the laboratory test.

Results of Examination of Official Seed Samples, 1944

Station number	Seed Company	Dealer	Seedman's Lot No. or Brand	Percentage				Date of Germination test	Noxious weeds, Common name and number per pound
				Pure seed	Weed seeds	Inert matter	Germination		
14689	Chas. M. Cox Co., Boston, Mass.	Scribner Grain Co., Brunswick, Me.	1 G* F*	91.05 99.19	1.89 0.07	0.02 0.02	99.00 99.00	Mar. 1944 June 1944	Wild oats 10
14707	H. K. Webster Co., Lawrence, Mass.	South Paris Farmers Union, South Paris, Me.	— G F	98.23 98.62	0.48 0.45	0.15 0.13	75.00 65.00	Mar. 1944 Aug. 1944	Wild oats 77
14690	J. Chas. McCullough Seed Co., Cincinnati, O.	ORCHARD GRASS Allen, Sterling & Lothrop, Portland, Me.	6050 G F	88.28 95.44	0.60 —	11.08 4.56	83.00 93.00	Jan. 1944 Apr. 1944	Yellow dock 9
14659	J. Chas. McCullough Seed Co., Cincinnati, O.	PEAS Allen, Sterling & Lothrop, Portland, Me.	— G F	99.50 99.78	0.00 —	0.50 0.22	90.00 96.00	Jan. 1944 May 1944	—
14771	Stanford Seed Co., Inc., Buffalo, N. Y.	Bangor Farmers Union, Bangor, Me.	2910 G F	99.50 99.75	0.00 —	0.50 0.25	90.00 86.00	Jan. 1944 June 1944	—
14670	Arthur R. Cone, Buffalo, N. Y.	Bideford-Saco Grain Co., Bideford, Me.	40-82 G F	90.50 99.98	— —	0.20 0.02	90.00 93.00	Nov. 1943 June 1944	—
14701	Eastern States Farmers' Exchange, West Springfield, Mass.	Eastern States Farmers' Exchange, Auburn, Me.	6721 G F	99.25 94.85	— —	0.75 0.15	92.00 93.00	Dec. 1943 June 1944	—
14657	J. Chas. McCullough Seed Co., Cincinnati, O.	RAPE Allen, Sterling & Lothrop, Portland, Me.	5800 G F	99.50 99.70	0.10 —	0.35 0.36	90.00 93.00	Jan. 1944 May 1944	—

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Results of Examination of Official Seed Samples, 1944

Station number	Seed Company	Dealer	Seedman's Lot No. or Brand	Percentage				Date of Germination test	Noxious weeds, Common name and number per pound
				Pure seed	Weed seeds	Inert matter	Germination	Hard seeds	
14675	Arthur R. Cone, Buffalo, N. Y.	Biddeford-Saco Grain Co., Biddeford, Me.	44-51	G* 99.80 F* 99.97	0.03	0.12 0.03	95.00 97.00	—	----- ----- -----
14643	J. Chas. McCullough Seed Co., Cincinnati, O.	REDTOP Allen, Sterling & Lothrop, Portland, Me.	5987	G 92.00 F 92.90	0.48 0.70	7.32 6.40	90.00 92.00	—	----- ----- -----
14748	Allied Seed Co., Fort Wayne, Ind.	Geo. A. Hall Co., Houston, Me.	B13	G 92.00 F 92.91	0.75 0.76	7.00 6.33	90.00 76.00	—	----- ----- -----
14717	Wertheimer-McGuinn Seed Co., Ligonier, Ind.	Walter H. Ray, Anson, Me.	5105	G 92.00 F 92.90	0.50 0.28	7.46 0.82	90.00 88.00	—	----- ----- -----
14687	Stanford Seed Co., Inc., Buffalo, N. Y.	Scribner Grain Co., Brunswick, Me.	3079	G 90.95 F 93.82	0.24 0.73	8.18 5.45	90.00 91.00	—	----- ----- -----
14737	Whitney Seed Co., Inc., Buffalo, N. Y.	Webber Grain & Feed Co., Yarmouth, Me.	4053	G 94.75 F 94.00	0.55 0.32	4.44 5.63	90.00 88.00	—	----- ----- -----
14650	J. Chas. McCullough Seed Co., Cincinnati, O.	RYE GRASS, Domestic Allen, Sterling & Lothrop, Portland, Me.	5817	G 99.25 F 99.08	0.14 0.02	0.51 0.60	93.00 93.00	—	----- ----- -----
14678	Arthur R. Cone, Buffalo, N. Y.	Biddeford-Saco Grain Co., Biddeford, Me.	39-68	G 99.53 F 99.42	0.12 0.28	0.31 0.30	92.00 97.00	—	----- ----- Rutabaga 90

* These letters indicate respectively given on the guaranty and found by the laboratory test.

Results of Examination of Official Seed Samples, 1944

Station number	Seed Company	Dealer	Seedman's Lot No. or Brand	Percentage				Date of Germination test	Noxious weeds, name and number per pound
				Pure seed	Weed seeds	Inert matter	Germination		
14067	Albert Dickinson Co., Chicago, Ill.	R. B. Dunning & Co., Bangor, Me.	088246 G* F*	90.50 99.74	0.24 0.06	0.24 0.20	94.00 90.00	Nov. 1943 July 1944	----- -----
14735	Eastern States Farmers' Exchange, West Springfield, Mass.	Eastern States Farmers' Exchange, Skowhegan, Me.	1115 G F	99.00 99.38	0.40 0.02	0.50 0.60	88.00 83.00	Dec. 1943 July 1944	----- Ribgrass 90
SOYBEANS									
14632	J. Chas. McCullough Seed Co., Cincinnati, O.	Allen, Sterling & Lothrop, Portland, Me.	5714 G F	99.18 99.93	0.27 0.03	0.55 0.01	90.00 94.00	Feb. 1944 May 1944	----- -----
14633	J. Chas. McCullough Seed Co., Cincinnati, O.	Allen, Sterling & Lothrop, Portland, Me.	8633 G F	88.50 99.61	0.02 —	0.60 0.39	88.00 85.00	Jan. 1944 May 1944	----- -----
14730	Eastern States Farmers' Exchange, West Springfield, Mass.	Eastern States Farmers' Exchange, Skowhegan, Me.	1129 G F	99.25 99.90	0.00 —	0.75 0.10	87.00 83.00	Jan. 1944 July 1944	----- -----
14731	Eastern States Farmers' Exchange, West Springfield, Mass.	Eastern States Farmers' Exchange, Skowhegan, Me.	1125 G F	99.50 99.72	— —	— 0.28	90.00 90.00	Jan. 1944 June 1944	----- -----
SUDAN GRASS									
14638	Albert Dickinson Co., Chicago, Ill.	R. B. Dunning & Co., Bangor, Me.	048333 G F	98.01 99.03	0.10 0.12	1.16 0.37	88.00 94.00	Dec. 1943 Apr. 1944	----- -----
14696	Eastern States Farmers' Exchange, West Springfield, Mass.	Eastern States Farmers' Exchange, Auburn, Me.	1118 G F	98.40 99.43	0.10 —	0.40 0.13	79.00 78.00	Dec. 1943 May 1944	----- -----

* These letters indicate respectively given on the guaranty and found by the laboratory test.

Results of Examination of Official Seed Samples, 1944

Station number	Seed Company	Dealer	Seedman's Lot No. or Brand	Percentage				Date of Germination test	Noxious weeds, name and number per pound
				Pure seed	Weed seeds	Inert matter	Germination		
		TIMOTHY							
14641	J. Chas. McCullough Seed Co., Cincinnati, O.	Allen, Sterling & Lothrop, Portland, Me.	5886 F*	99.60 99.45	0.05 0.10	0.25 0.40	91.00 94.00	Jan. 1944 Apr. 1944	Black mustard 225, Ribgrass 126
14769	The Belt Seed Co., Baltimore, Md.	Geo. E. Buck, Caribou, Me.	583 F	99.60 99.00	0.20 0.40	0.20 0.55	92.00 83.00	Mar. 1944 June 1944	Yellow dock 225, Ox-eye daisy 18, Canada thistle 9
14710	Whitney Seed Co., Inc., Buffalo, N. Y.	Burbank Seed Co., Portland, Me.	12819 F	99.60 99.75	0.05 0.05	0.30 0.20	90.00 94.00	Apr. 1944 May 1944	-----
14605	Albert Dickinson Co., Chicago, Ill.	R. B. Dunning & Co., Bangor, Me.	66554-55 F	99.70 99.45	0.05 0.05	0.15 0.45	90.00 92.00	Jan. 1944 Apr. 1944	-----
14603	Eastern States Farmers' Exchange, West Springfield, Mass.	Eastern States Farmers' Exchange, Auburn, Me.	1089 F	99.60 99.50	0.05 0.10	0.25 0.30	90.00 87.00	Dec. 1943 May 1944	-----
14702	Arthur R. Cone, Buffalo, N. Y.	Farm Service Store, Auburn, Me.	10-472 F	99.63 99.10	0.10 0.35	0.14 0.50	90.00 85.00	Dec. 1943 May 1944	Ribgrass 36
14744	Allied Seed Co., Fort Wayne, Ind.	Geo. A. Hall Co., Houlton, Me.	B2076 F	99.60 99.50	0.10 0.10	0.12 0.25	90.00 87.00	Jan. 1944 June 1944	-----
14716	Wertheimer-McGuinn Seed Co., Ligonier, Ind.	Walter H. Ray, Anson, Me.	2 F	98.00 99.00	0.10 —	0.40 0.76	90.00 85.00	Jan. 1944 June 1944	-----
14685	Stanford Seed Co., Inc., Buffalo, N. Y.	Scribner Grain Co., Brunswick, Me.	2877 F	99.60 99.45	0.05 —	0.30 0.50	90.00 90.00	Feb. 1944 May 1944	-----

* These letters indicate respectively given on the guaranty and found by the laboratory test.

Results of Examination of Official Seed Samples, 1944

Station number	Seed Company	Dealer	Seedman's Lot No. or Brand	Percentage				Date of Germination test	Noxious weeds, Common name and number per pound
				Pure seed	Weed seeds	Inert matter	Germination		
14755	The Balt Seed Co., Baltimore, Md.	York & Fenderson, Mars Hill, Me.	556	G* 99.60 F* 99.55	0.10 0.05	0.30 0.30	92.00 92.00	Dec. 1943 June 1944	----- -----
14654	J. Chas. McCullough Seed Co., Cincinnati, O.	WHEAT Allen, Sterling & Lothrop, Portland, Me.	6017	G 99.38 F 99.98	0.01 0.01	0.61 0.01	93.00 90.00	Feb. 1944 May 1944	----- Field bindweed 5
14654	Albert Dickinson Co., Chicago, Ill.	R. B. Dunning & Co., Bangor, Me.	075116	G 98.70 F 99.94	0.01 —	0.75 —	92.00 90.00	Jan. 1944 May 1944	----- -----
14769	Eastern States Farmers' Exchange, West Springfield, Mass.	Eastern States Farmers' Exchange, Presque Isle, Me.	1102	G 99.50 F 99.86	— —	0.50 0.09	91.00 92.00	Dec. 1943 June 1944	----- -----
14740	Whitney Seed Co., Inc., Buffalo, N. Y.	Morrill's Coal & Grain Co., Portland, Me.	84110	G 98.75 F 99.89	0.45 —	0.50 —	90.00 91.00	Feb. 1944 June 1944	----- -----
14722	Stanford Seed Co., Inc., Buffalo, N. Y.	Piper's Feed Mill, Norridgecock, Me.	3021	G 99.63 F 99.99	0.05 —	0.32 —	94.00 89.00	Jan. 1944 June 1944	----- Field bindweed 13
14764	The Belt Seed Co., Baltimore, Md.	A. D. Soucy, Fort Kent, Me.	1437	G 99.00 F 99.97	0.10 —	0.60 0.03	90.00 87.00	Mar. 1944 June 1944	----- -----

* These letters indicate respectively given on the guaranty and found by the laboratory test.

FUNGICIDES AND INSECTICIDES, 1944

ELMER R. TOBEY

Forty-four samples of fungicidal and insecticidal materials were collected and submitted to the Maine Agricultural Experiment Station by the Division of Inspection, Department of Agriculture, Augusta, Maine. These samples include calcium arsenate, lead arsenate, Paris green, mixtures containing arsenic and copper, fungicides containing copper, materials containing rotenone, and several unclassified miscellaneous samples. With the exception of the miscellaneous samples the results of analyses are reported in tabular form. Credit for the analytical work is due to C. Harry White and Lloyd G. Keirstead; for the compilation of the results of analyses to Rose H. McGuigan, Stenographer.

EXPLANATION OF TABLES

Nearly all of the manufacturers of fungicides and insecticides express the guaranties in terms of the metallic elements as well as equivalent compounds of these elements. In the tables which follow the results of analyses are expressed as far as possible as metallic.

TABLE 1

Calcium Arsenate

Station number	Name and address of manufacturer or wholesaler, and trade name of brand	Town where collected	Total Metallic Arsenic		Water Soluble Metallic Arsenic	
			Guaranteed per cent	Found per cent	Guaranteed per cent	Found per cent
					Not more than	
31837	Eastern States Farmers' Exchange, West Springfield, Mass. Arsenate of Calcium	Brewer	26.00	26.86	0.75	0.32
31841	Lucas Kil-Tone Co., Philadelphia, Pa. Calcium Arsenate	Calais	26.00	27.55	0.50	0.23
31826	Sherwin-Williams Co., Cleveland, O. Arsenate of Calcium	Portland	26.10	26.41	0.50	0.12

TABLE 2

Lead Arsenate

Station number	Name and address of manufacturer or wholesaler, and trade name of brand	Town where collected	Total Metallic Arsenic		Water Soluble Metallic Arsenic	
			Guaranteed per cent	Found per cent	Guaranteed per cent Not more than	Found per cent
31821	Acme White Lead & Color Works, Detroit, Mich. Arsenate of Lead	Norway	19.50	21.49	0.50	0.21
31812	Chipman Chemical Co., Bound Brook, N. J. Lead Arsenate	Lewiston	21.19	21.12	0.25	0.14
31838	Eastern States Farmers' Exchange, West Springfield, Mass. Arsenate of Lead	Brewer	19.56	20.92	0.25	0.13
31818	General Chemical Co., New York, N. Y. Arsenate of Lead (Mechling's)	South Paris	19.56	20.54	0.25	0.23
31813	Miller Chemical & Fertilizer Corp., Baltimore, Md. Arsenate of Lead	Lewiston	20.20	20.41	0.50	0.25
31810	Niagara Sprayer & Chemical Co., Inc., Middleport, N. Y. Lead Arsenate	Portland	19.50	20.64	0.50	0.18
31843	Sears, Roebuck & Co., Chicago, Ill. Lead Arsenate	Portland	19.60	20.41	0.49	0.16
31827	Sherwin-Williams Co., Cleveland, O. Arsenate of Lead	Portland	19.50	21.02	0.50	0.24
31833	Naga.	Presque Isle	19.50	21.20	0.50	0.16

TABLE 3

Paris Green

Station number	Name and address of manu- facturer or wholesaler, and trade name of brand	Town where collected	Total Arsenious Oxide		Water Soluble Arsenious Oxide	
			Guar- anteed per cent	Found per cent	Guar- anteed per cent	Found per cent
					Not more than	
31822	Acme White Lead & Color Works, Detroit, Mich. Paris Green	Portland	50.00	54.00	3.50	1.33
31809	Dow Chemical Co., Midland; Mich. Paris Green	Portland	50.00	54.50	3.50	0.82
31834	Sherwin-Williams Co., Cleveland, O. Paris Green	Presque Isle	50.00	56.20	*	1.02†

* Guaranteed Metallic arsenic in water soluble form not more than 2.7 per cent.

† Equivalent to 0.77 per cent metallic arsenic.

TABLE 4

Mixtures Containing Arsenic and Copper

Station number	Name and address of manufacturer, wholesaler, or dealer and trade name of brand	Town where collected	Total Metallic Arsenic		Water Soluble Metallic Arsenic		Total Metallic Copper	
			Guaranteed per cent	Found per cent	Guaranteed per cent not more than	Found per cent	Guaranteed per cent	Found per cent
31847	Acme White Lead & Color Works, Detroit, Mich. Red River Potato Mix	Brunswick	22.00	22.80	2.00	1.00	12.50	19.40
31842	Dow Chemical Co., Midland, Mich. Dow Special Potato Spray	Calais	26.00	26.54	1.31	1.06	7.50	7.52
31844	Goulard & Olen, Inc., New York, N. Y. Magnesium Bordo Arsenate	Portland	14.40	15.13	0.50	0.50	5.25	5.44
31832	Hammond Paint & Chemical Co., Beacon, N. Y. Potato Mix	Houlton	6.50	8.15	0.225	0.05	6.00	6.60
31846	The Mackwin Co., Winona, Minn. Potato-Tomato Dust	Brunswick	5.00	5.73	0.10	0.09	5.00	5.32
31823	Niagara Sprayer & Chemical Co., Inc., Middleport, N. Y. Vegetable Garden Dust or Spray	Portland	2.50	3.52	0.50	0.14	9.00	11.04
31825	Sherwin-Williams Co., Cleveland, O. Pestroy	Portland	2.80	3.78	0.30	0.21	11.00	11.68
31835	Potato Spray	Presque Isle	6.50	6.98	0.50	0.23	9.00	9.40

TABLE 5

Fungicides Containing Copper

Station number	Name and address of manufacturer wholesaler, or dealer and trade name of brand	Town where collected	Total Metallic Copper	
			Guaranteed per cent	Found per cent
31820	General Chemical Co., New York, N. Y. Bordeaux Mixture (Mechling's)	Norway	12.75	13.64
31845	Goulard & Olen, Inc., New York, N. Y. Magnesium Bordo Mixture	Portland	12.75	12.80
31824	Niagara Sprayer & Chemical Co., Inc., Middleport, N. Y. Dry Bordo Dust or Spray	Portland	12.75	13.00
31828	Sherwin-Williams Co., Cleveland, O. Fungl-Bordo	Portland	12.75	13.28

TABLE 6

Materials Containing Rotenone

Station number	Name and address of manufacturer or wholesaler, and trade name of brand	Town where collected	Total ether extractives	Rotenone	
			Found per cent	Guaranteed per cent	Found per cent
31819	Bonide Chemical Co., Inc., Utica, N. Y. Rotosyn	Norway	0.49	0.75	0.04
31804	General Insecticide Co., Utica, N. Y. Garden Dust or Spray Containing Rotenone	Portland	3.81	0.50	0.12
31814	Miller Chemical & Fertilizer Corp., Baltimore, Md. V-33 Rotenone	Lewiston	1.89	0.33	0.28
31807	Niagara Sprayer & Chemical Co., Inc., Middleport, N. Y. Rotenone Bearing Dust or Spray	Portland	2.33	0.50	0.96

MISCELLANEOUS FUNGICIDES AND INSECTICIDES

Station
number

- 31839 Calomel Gypsum Dust. Manufactured by Eastern States Farmers' Exchange, West Springfield, Mass. Sample collected at Brewer. Guaranteed: Active ingredients, Calomel 4.00%; Inert ingredients 96.00%. Found: Calomel 5.11%.
- 31829 CCC Copper Rote. Manufactured by Carbola Chemical Co., Inc., Natural Bridge, N. Y. Sample collected at Augusta. Guaranteed: Beta thiocyanate ethyl esters of aliphatic fatty acids .75%; Metallic copper 6.00%; Other derris resins 1.05%; Rotenone .40%. Found: Copper expressed as metallic 6.08%; Total ether extractives 1.32%; Rotenone 0.21%.
- 31836 Cutworm Bait. Manufactured by Goulard & Olenka, Inc., New York, N. Y. Sample collected at Old Town. Guaranteed: Copper acetate arsenite 1.35%; Sodium arsenate 0.38%; Inert ingredients 98.27%; Total arsenic as metallic arsenic 0.66%; Water soluble arsenic as metallic arsenic not over 0.25%. Found: Total arsenic expressed as metallic 1.50%; Water soluble arsenic expressed as metallic 1.14%.
- 31808 Dry Lime Sulphur. Manufactured by Niagara Sprayer & Chemical Co., Inc., Middleport, N. Y. Sample collected at Portland. Guaranteed: Calcium polysulphide 70.00%; Calcium thiosulphate 5.00%; Sulphur 10.00%; Inert ingredients 15.00%. Found: Total sulphur 63.74%.
- 31811 Garden Dust Containing Rotenone and Copper. Manufactured by General Insecticide Co., Utica, N. Y. Sample collected at Lewiston. Guaranteed: Beta thiocyanate ethyl esters of aliphatic fatty acids averaging 10-18 carbon atoms 1.13%; Derris resins including rotenone .50%; Cuprous oxide 4.5%; Metallic copper 4.06%; Inert ingredients 93.8%. Found: Total copper as metallic 4.16%; Total ether extractives 2.18%; Rotenone 0.14%.
- 31806 Go-West Improved Insect Bait. Manufactured by Agricultural Laboratories, Inc., Columbus, O. Sample collected at Portland. Guaranteed: Sodium fluosilicate 3.50%; Inert ingredients 96.50%; Active fluorine 2.12%. Found: Fluorine 2.97%.
- 31831 Hammond's Grape and Rose Dust. Manufactured by Hammond Paint & Chemical Co., Beacon, N. Y. Sample collected at Houlton. Guaranteed: Sulphur 64.00%; Copper sulphate 2.50%; Inert ingredients 33.50%. Found: Copper expressed as metallic 1.08% equivalent to copper expressed as copper sulphate 4.24%, or to copper expressed as monohydrated copper sulphate 3.02%, or to copper expressed as anhydrous copper sulphate 2.71%; Total sulphur 67.23%.
- 31805 Lime Sulphur. Manufactured by Acme White Lead & Color Works, Detroit, Mich. Sample collected at Portland. Guaranteed: Inert ingredients 20.00%; Calcium polysulphides 70.00%; Calcium thiosulphate 5.00%; Sulfur 5.00%. Found: Total sulphur 63.23%.
- 31817 Mexican Bean Beetle Destroyer Dust or Spray. Manufactured by Niagara Sprayer & Chemical Co., Inc., Middleport, N. Y. Sample collected at Norway. Guaranteed: Tri magnesium arsenate 12.50%; Inert ingredients 87.50%; Arsenic expressed as arsenic pentoxide 8.18%; Arsenic expressed as metallic 5.22%; Arsenic expressed as commercial magnesium arsenate 25.60%; Arsenic in water soluble forms expressed as metallic .50%. Found: Total arsenic as metallic 5.74%; Water soluble arsenic as metallic 0.18%.
- 31840 Nicotine Sulphate. Manufactured by Eastern States Farmers' Exchange, West Springfield, Mass. Sample collected at Brewer. Guaranteed: Active ingredients, Nicotine 40.00%; Inert ingredient 60.00%. Found: Nicotine expressed as alkaloid 40.00%.
- 31816 Nicotine Sulphate 40%. Manufactured by Goulard & Olenka, Inc., New York, N. Y. Sample collected at Lewiston. Guaranteed: Nicotine expressed as alkaloid 40.00%; Inert ingredients 60.00%. Found: Nicotine as alkaloid 40.42%.
- 31830 Victory Garden Dust or Spray. Manufactured by Niagara Sprayer & Chemical Co., Inc., Middleport, N. Y. Sample collected at Augusta. Guaranteed: Copper expressed as metallic 3.98%; Tri calcium arsenate 5.18%; Nicotine 1.00%; Inert ingredients 89.84%; Arsenic expressed as metallic 1.92%; Arsenic expressed as arsenic trioxide 2.54%; Arsenic in water soluble form expressed as metallic .50%, expressed as arsenic pentoxide .75%. Found: Copper expressed as metallic 4.14%; Nicotine as alkaloid 1.87%; Total arsenic expressed as metallic 3.39%; Water soluble arsenic expressed as metallic 0.18%.
- 31815 Victory 76. Manufactured by Hammond Paint & Chemical Co., Beacon, N. Y. Sample collected at Lewiston. Guaranteed: Beta thiocyanate ethyl esters of aliphatic fatty acids averaging 10-18 carbon atoms .75%; Sulphur (300 mesh) 9.00%; Nicotine .08%; Dry calcium arsenate 8.31%; Total arsenic expressed as metallic arsenic (AS) not less than 3.12%, equivalent to arsenic oxide 4.8%; Arsenic in water soluble form .10%; Arsenic pentoxide equivalent to arsenic .085%. Found: Total sulphur 10.76%; Nicotine Trace; Total arsenic as metallic 5.02%; Water soluble arsenic as metallic 0.09%.

LAW GOVERNING QUALITY, PURITY, AND REGISTRATION OF
FUNGICIDES AND INSECTICIDES

Submitted by Mr. A. M. G. Soule, Chief
Division of Inspection
Augusta, Maine

Chapter 41, Revised Statutes, 1930

FUNGICIDES AND INSECTICIDES

Protection Against Adulterated or Misbranded Goods

Sec. 1. *Sale of certain adulterated articles prohibited.* No person shall, within this state, manufacture, sell, distribute, transport, offer or expose for sale, distribution, or transportation, any article of fungicide or insecticide which is adulterated or misbranded within the meaning of this chapter.

Sec. 2. *Definitions.* The term "fungicide" as used herein shall be held to include any substance or mixture of substances intended to be used for preventing, destroying, repelling, or mitigating any and all fungi that may infest vegetation, or be present in any environment whatsoever.

The term "insecticide" as used herein shall include Paris green, lead arsenate, and any substance or mixture of substances intended to be used for preventing, destroying, repelling, or mitigating any insect which may infest vegetation, man, animals, or houses, or be present in any environment whatsoever.

Sec. 15. *Marking of packages of fungicide.* Every lot or package of a fungicide or an insecticide which is manufactured, sold, distributed, transported, offered or exposed for sale, distribution or transportation in the state by any person, shall have affixed in a conspicuous place on the outside thereof a plainly printed statement clearly and truly stating the number of net pounds in the package, the name or trade-mark under which the article is sold, the name and address of the manufacturer or shipper, and a chemical analysis stating the minimum percentage of total arsenic and the maximum percentage of water-soluble arsenic which it contains, the constituents to be determined by the methods adopted by the association of official agricultural chemists.

Sec. 16. *Manufacture and sale of fungicides, etc., regulated; registration fee.* Any person who shall manufacture, sell, distribute, transport, offer or expose for sale, distribution or transportation in the state any fungicide or insecticide shall before so doing file with the commissioner of agriculture for each and every fungicide or insecticide bearing a distinguishing name or trade-mark, a certified copy of the statements made in accordance with the preceding section. Said certified copy shall be accompanied when said commissioner of agriculture shall so request with a sealed package containing not

less than one pound of the fungicide or insecticide. The person filing such certificate shall pay annually to the commissioner of agriculture a registration fee of ten dollars, this fee to be assessed on any brand offered for sale, distribution or transportation in the state, except that said fee shall not be assessed for registration of a fungicide or insecticide consisting of organic matter and not containing any added inorganic matter or mineral chemical, provided that a complete chemical analysis of said fungicide or insecticide is given in, and as part of, the certificate required under this section. Whenever any person shall have filed said certificate and paid said registration fee, no other person shall be required to file such statement or pay such fee.

Sec. 17. The commissioner of agriculture may cancel the registration of any fungicide or insecticide that he deems to be manufactured, sold, distributed, transported, offered or exposed for sale, distribution or transportation in violation of any of the provisions of this chapter. The registration of each brand of fungicide or insecticide shall terminate on the thirty-first day of December of each year.

Sec. 18. When goods shall be deemed to be adulterated. For the purpose of this chapter an article shall be deemed to be adulterated:

In case of FUNGICIDE or INSECTICIDE:

In the case of PARIS GREEN:

First. If it does not contain at least fifty per cent of arsenious oxide (As_2O_3).

Second. If it contains arsenic in water-soluble forms equivalent to more than three and one-half per cent of arsenious oxide (As_2O_3).

Third. If any substance has been mixed and packed with it so as to reduce or lower or injuriously affect its quality or strength.

In the case of LEAD ARSENATE:

First. If it contains more than fifty per cent of water.

Second. If it contains total arsenic equivalent to less than twelve and one-half per cent of arsenic oxide (As_2O_5).

Third. If it contains arsenic in water-soluble forms equivalent to more than seventy-five one-hundredths per cent of arsenic oxide (As_2O_5).

Fourth. If any substances have been mixed and packed with it so as to reduce, lower, or injuriously affect its quality or strength: provided, however, that extra water may be added to lead arsenate if the resulting mixture is labeled lead arsenate and water, the percentage of extra water being plainly and correctly stated on the label.

In the case of FUNGICIDE or INSECTICIDE OTHER THAN PARIS GREEN AND LEAD ARSENATE:

First. If its strength or purity fall below the professed standard or quality under which it is sold.

Second. If any substance has been substituted wholly or in part for the article.

Third. If any valuable constituent of the article has been wholly or in part abstracted.

Fourth. If it is intended for use on vegetation and shall contain any substance or substances injurious to such vegetation.

Sec. 19. *Term "misbranded" defined.* The term "misbranded" as used herein, shall apply to all articles of fungicide and insecticide, the package or label of which shall bear any statement, design, or device regarding such article, or the ingredients or substances contained therein which shall be false or misleading in any particular, or which is falsely branded in any particular.

For the purpose of this chapter an article shall also be deemed to be misbranded:

In case of FUNGICIDE AND INSECTICIDE:

First. If any lot or package fail to bear all the statements required by section fifteen.

Second. If the printed statements required by section fifteen to be affixed to the lot or package differ from the statements required by section sixteen.

Third. If any brand is manufactured, transported, distributed, sold or offered or exposed for sale, distribution or transportation upon which the registration fee required by section sixteen has not been paid.

Fourth. If it be an imitation of or offered for sale under the name of another article.

Fifth. If it be labeled or branded so as to deceive or mislead the purchaser, or if the contents of the package as originally put up shall have been removed in whole or in part and other contents shall have been placed in such packages.

Sixth. If it consists partially or completely of an inert substance or substances which do not prevent, destroy, repel, or mitigate insects or fungi and does not have the percentage amount of such inert ingredient plainly and correctly stated on the label.

Sec. 30. *Annual analysis; results of analyses to be published.* The director of the Maine Agricultural Experiment Station shall annually analyze, or cause to be analyzed, samples of articles of fungicide and insecticide, at such time and to such extent as the commissioner of agriculture may determine. And said commissioner, in person or by deputy, shall have free access, ingress and egress at all reasonable hours to any place or any building wherein articles of fungicide or insecticide are manufactured, stored, transported, sold, offered or exposed for sale. He may also, in person or by deputy, open any case, package or other container, and may, upon tendering the market price take samples for analysis. The results of all analyses of fungicide and insecticide made by said director shall be published by him in the bulletins or reports of the experiment station, together with the names of the persons from whom the samples were obtained, the names of the manufacturers thereof and such additional information as to him may seem advisable.

Sec. 35. *Certificates signed by director, presumptive evidence.* Every certificate duly signed and acknowledged by the director of the Maine Agricultural Experiment Station, relating to the collection and analysis of any sample of fungicide or insecticide, shall be presumptive evidence of the facts therein stated.

Sec. 36. *Penalty for adulterating or misbranding.* Any person who adulterates or misbrands within the meaning of this chapter, any fungicide or insecticide, or any person who manufactures, sells, distributes, transports,

offers or exposes for sale, distribution or transportation any article of fungicide or insecticide in violation of any provisions of this chapter, whoever violates said provisions shall be punished by a fine of not more than one hundred dollars for the first offense, and by a fine of not more than two hundred dollars for each subsequent offense.

June, 1945

MAINE
AGRICULTURAL EXPERIMENT STATION
ORONO, MAINE

CHEMISTS

Elmer R. Tobey
Bernie E. Plummer, Jr.
*Edward O. Merrill
Lloyd G. Keirstead

C. Harry White
Millard G. Moore
*A. Stanley Getchell

BACTERIOLOGISTS

Millard G. Moore
*John S. Getchell

*C. Byron Sibley
Dorothea Nealey

Official Inspections

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FOODS AND DRUGS

ELMER R. TOBEY

The Commissioner of Agriculture is the executive of the laws regulating the sale of foods and drugs in Maine. It is the duty of the Director of the Maine Agricultural Experiment Station to make, or to cause to have made, the analyses of the samples collected by the Commissioner, and to publish the results of the analyses together with such additional information as may seem advisable.

NOTE: All correspondence relative to the inspection laws and requests for copies of the laws should be addressed to the Division of Inspection, Department of Agriculture, Augusta, Maine.

* On leave of absence. Military service.

FOODS AND DRUGS INSPECTION

In this bulletin are given the results of the analyses of the official samples of foods and drugs which were collected and submitted to the Maine Agricultural Experiment Station by the Division of Inspection and the State Dairy Inspector of the Department of Agriculture from May 1, 1944, to May 1, 1945.

The number and variety of samples, which are collected and submitted by the Division of Inspection, depend upon the nature of the inspection work carried on in the enforcement of the food and drug laws. A large amount of this inspection work does not require the collection of samples and no report in regard to it is given in this publication.

Samples of bologna, frankfurts, sausage, dairy products (milk and cream), dietetic beverage, Hamburg steak, maple syrup, imitation olive oil, oil used in packing sardines, pickling compounds, vinegar, sardines, shellfish, hydrochloric acid, spirit of camphor, and spirit of peppermint, have been examined and the results reported herein.

In the bacteriological laboratory a total of two thousand one hundred six samples have been examined. This number includes one thousand six hundred ninety-eight official samples of milk and cream, twenty-four samples of Hamburg steak, twenty-five samples of ice cream, eight samples of potato starch, one hundred eighty-three samples of clams, sixty-three samples of mussels, and one hundred five miscellaneous samples. The miscellaneous samples have been examined for the United States Army, municipal departments of health, and private individuals. It was found by analysis that twelve of the official samples of milk were adulterated by the addition of water.

Credit for the analytical work reported in this publication is due to each member of the Department of Chemistry; for the compilation of the results of analyses to Rose H. McGuigan, Stenographer.

GLASSWARE FOR TESTING MILK AND CREAM

The State law requires that all Babcock glassware used by creameries, ice cream factories, and others buying or selling milk or cream on a basis of the butterfat content, be tested for accuracy

at the Maine Agricultural Experiment Station. One thousand one hundred two pieces have been examined. One piece was not passed.

BOLOGNA, FRANKFURTS, AND SAUSAGE

Six samples of bologna, frankfurts, and sausage were received for analysis. The results of the analyses indicate no evidence of adulteration with cereal and water. No sulfite was found.

Table showing the results of the analyses of six samples of bologna, frankfurts, and sausage

number	Sample	Dealer and town	Manufacturer or wholesaler	Water per cent	Fat per cent	Qualitative test for starch	Qualitative test for sulfite
3752	Frankfurt	Great Atlantic & Pacific Tea Co., The, Portland	Boston Sausage & Provision Co., Boston, Mass.	57.77	21.13	Negative	Negative
3753	Sausage	Great Atlantic & Pacific Tea Co., The, Portland	John P. Squire & Co., Boston, Mass.	35.01	44.69	Negative	Negative
3754	Frankfurt	Pine Street Market, Portland	Swift & Co., Portland	50.92	29.29	Negative	Negative
3749	Frankfurt	Shaw Co., George O., Portland	Oscar Mayer & Co., Madison, Wis.	54.80	25.94	Negative	Negative
3750	Bologna	Shaw Co., George O., Portland	Armour & Co., Chicago, Ill.	56.53	23.41	Negative	Negative
3751	Frankfurt	Twentieth Century Market, Portland	John P. Squire & Co., Boston, Mass.	57.67	22.82	Negative	Negative

DAIRY PRODUCTS (MILK AND CREAM)

The standards for milk, as fixed by statute, are total solids at least 11.75 per cent and butterfat at least 3.25 per cent. A recommendation by the State Dairy Division specifies that raw milk of good quality shall have a bacteria count that shall not exceed 50,000 per cubic centimeter by the American Public Health Association official plate count method.

Pasteurized milk, as defined by law, is milk, every particle of which has been heated to a temperature of 142° to 145° F., and held at this temperature for 30 minutes, after which it shall be immediately cooled to below 50° F., and held at this temperature until delivered to the consumer. The bacteria count shall not

exceed 25,000 per cubic centimeter by the American Public Health Association official plate count method. Pasteurized milk shall be processed under certain prescribed sanitary conditions.

Grade A milk, as defined by law, shall be milk which at the time of its delivery shall not contain more than 25,000 bacteria per cubic centimeter by the American Public Health Association official plate count method. It shall contain at least 3.75 per cent butterfat, and comply with certain sanitary conditions of production and handling.

The standard for cream, as fixed by statute, is at least 18 per cent butterfat. Standards, specified by a regulation of the State Milk Control Board, relative to light, medium, and heavy grades are as follows: light 18 to 20 per cent butterfat, medium 30 to 34 per cent butterfat, heavy 40 per cent and over butterfat. However, under the Second War Powers Act the War Food Administration promulgated a regulation which prohibits the distribution, except to another handler, of cream having a butterfat content in excess of 19 per cent. A recommendation by the State Dairy Division specifies that cream of good quality shall have a bacteria count that shall not exceed 100,000 per cubic centimeter by the American Public Health Association official plate count method.

All samples marked "pasteurized" were tested for the efficiency of the process of pasteurization, and the results of the tests which show unsatisfactory pasteurization are reported in the table under "Remarks."

In the tables showing the results of the analyses of samples of milk which follow, the grade A pasteurized and raw samples, the pasteurized samples, and the raw samples appear in separate tables in the above named order.

*Table showing the results of the analyses of samples of grade A milk,
pasteurized and raw*

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
AUBURN										
17574	AJ 188	11-21-44	Hood & Sons, Inc., H. P	1.0310	4.1	8.58	12.68	C	3,000†	Pasteurized
BANGOR and BREWER										
17104	R 50	8-15-44	Footman's Dairy	1.0312	4.1	8.66	12.76	C	3,000	Pasteurized
18049	R 267	3- 1-45	Higgins Dairy	1.0314	3.5	8.56	12.06	S	235,000	Pasteurized
BELFAST										
16641	S 300	6-13-44	Round Top Farms	1.0321	4.1	8.86	12.96	C	3,000†	Pasteurized
17226	S 98	9- 7-44	Round Top Farms	1.0315	3.8	8.65	12.45	S	3,000†	Pasteurized
17755	S 306	1-23-45	Round Top Farms	1.0326	4.5	9.07	13.57	C	3,000†	Pasteurized
CAMDEN										
16736	S 332	6-16-44	Round Top Farms	1.0308	3.9	8.49	12.39	C	3,000†	Pasteurized
DAMARISCOTTA										
16698	FS 455	6-14-44	Round Top Farms	1.0309	4.1	8.63	12.53	S	3,000	Pasteurized
GARDINER										
16604	FS 424	5-12-44	Gardiner, R. H.	1.0329	4.3	9.11	13.41	S	187,000	Pasteurized
16605	FS 425	5-12-44	Gardiner, R. H.	1.0326	4.6	9.09	13.69	C	36,000	Raw
16733	FS 478	6-15-44	Gardiner, R. H.	1.0332	4.5	9.22	13.72	C	120,000	Raw
17206	FS 144	9- 2-44	Gardiner, R. H.	1.0320	4.2	8.85	13.05	C	6,000	Raw
ROCKLAND										
18000	S 352	2-22-45	Round Top Farms	1.0324	4.2	8.95	13.15	U	3,000†	Pasteurized
18268	S 401	4-25-45	Round Top Farms	1.0318	4.1	8.78	12.88	U	3,000†	Pasteurized

* C—Clean, S—Satisfactory, U—Unsatisfactory.

† Less than.

Table showing the results of the analyses of samples of pasteurized milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
ALFRED										
16949	AJ 53	7-21-44	Roux & Son, Conrad	1.0305	3.6	8.36	11.9	C	11,000	
AUGUSTA										
17202	FS 140	9-2-44	Drew's Dairy	1.0315	4.2	8.73	12.9	S	97,000	Sediment test on one-half pint
17203	FS 141	9-2-44	Drew's Dairy	1.0319	4.0	8.78	12.7	S	9,000	
17780	H 31	1-24-45	Drew's Dairy	1.0323	4.1	8.91	13.0	S	3,000†	
17876	H 82	2-3-45	Drew's Dairy	1.0319	4.4	8.87	13.2	S	23,000	
18177	H 263	3-31-45	Drew's Dairy	1.0314	3.9	8.64	12.5	S	3,000†	
16888	FS 34	7-13-44	North Augusta Dairy	1.0305	3.9	8.42	12.3	S	15,000	
17188	FS 123	9-1-44	North Augusta Dairy	1.0318	4.3	8.82	13.1	U	271,000	
17836	H 72	1-27-45	North Augusta Dairy	1.0340	4.3	9.38	13.6	S	3,000†	
18237	H 289	4-13-45	North Augusta Dairy	1.0332	3.9	9.09	12.9	C		No bacteria count made
BANGOR and BREWER										
16768	R 283	6-28-44	Davis, T. & J. J.	1.0313	3.5	8.54	12.04	U	3,000†	
18046	R 204	3-1-45	Davis, T. & J. J.	1.0313	3.5	8.54	12.04	S	48,000	
16757	R 275	6-28-44	Footman's Dairy	1.0317	3.8	8.70	12.50	S	46,000	Underpasteurized
16758	R 276	6-28-44	Footman's Dairy	1.0317	3.8	8.70	12.50	S	39,000	
16759	R 277	6-28-44	Footman's Dairy	1.0320	4.5	8.92	13.42	C	11,000	
17102	R 48	8-15-44	Footman's Dairy	1.0311	4.1	8.61	12.71	S	357,000	Underpasteurized
17103	R 49	8-15-44	Footman's Dairy	1.0311	3.8	8.55	12.35	C	7,000	
17106	R 52	8-15-44	Footman's Dairy	1.0313	3.7	8.58	12.28	C	24,000	
17257	R 54	9-13-44	Footman's Dairy	1.0327	4.1	9.03	13.13	C	150,000	
17260	R 63	9-13-44	Footman's Dairy	1.0330	4.2	9.11	13.31	C	100,000	
17267	R 64	9-13-44	Footman's Dairy	1.0320	4.3	8.88	13.18	C	14,000	
17268	R 65	9-13-44	Footman's Dairy	1.0320	4.1	8.83	12.93	C		No bacteria count made
17501	R 111	10-31-44	Footman's Dairy	1.0325	4.4	9.03	13.43	C	129,000	
17503	R 113	10-31-44	Footman's Dairy	1.0335	4.8	9.36	14.16	C	13,000	
17504	R 114	10-31-44	Footman's Dairy	1.0327	4.4	9.08	13.48	C	18,000	
17505	R 115	10-31-44	Footman's Dairy	1.0326	4.4	9.05	13.45	C	3,000†	
17643	R 167	12-20-44	Footman's Dairy	1.0327	4.6	9.12	13.72	C	172,000	
17644	R 168	12-20-44	Footman's Dairy	1.0317	4.3	8.80	13.10	C	37,000	
17645	R 169	12-20-44	Footman's Dairy	1.0317	4.0	8.74	12.74	C	4,000	
17646	R 170	12-20-44	Footman's Dairy	1.0326	4.1	8.98	13.08	C	97,000	
17901	R 222	2-7-45	Footman's Dairy	1.0320	4.5	8.92	13.42	C	12,000	
17902	R 223	2-7-45	Footman's Dairy	1.0317	3.6	8.66	12.26	C	21,000	
17903	R 224	2-7-45	Footman's Dairy	1.0319	4.0	8.78	12.78	C	44,000	
17904	R 225	2-7-45	Footman's Dairy	1.0320	4.3	8.88	13.18	C	42,000	
18052	R 270	3-1-45	Footman's Dairy	1.0320	3.7	8.75	12.45	S	71,000	
18053	R 271	3-1-45	Footman's Dairy	1.0326	4.5	9.07	13.57	C	8,000	
18154	R 272	3-1-45	Footman's Dairy	1.0315	4.2	8.73	12.93	S	29,000	
18249	R 328	4-17-45	Footman's Dairy	1.0323	4.1	8.91	13.01	C	118,000	
18250	R 329	4-17-45	Footman's Dairy	1.0315	4.0	8.69	12.69	C	17,000	
18251	R 330	4-17-45	Footman's Dairy	1.0317	4.0	8.74	12.74	S	32,000	
18252	R 331	4-17-45	Footman's Dairy	1.0317	4.1	8.76	12.86	C	224,000	
16766	R 284	6-28-44	Glenk Farms	1.0329	4.1	9.05	13.15	U	5,000	
17502	R 112	10-31-44	Glenk Farms	1.0325	4.5	9.05	13.55	C	69,000	Underpasteurized
18041	R 259	3-1-45	Glenk Farms	1.0336	3.9	9.19	13.09	S		No bacteria count made
16764	R 282	6-28-44	Grant's Dairy	1.0317	3.9	8.72	12.62	C	12,000	
17232	R 59	9-13-44	Grant's Dairy	1.0323	4.0	8.89	12.89	C	55,000	

* C—Clean, S—Satisfactory, U—Unsatisfactory.

† Less than.

Table showing the results of the analyses of samples of pasteurized milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
Bangor and Brewer—Cont.										
17500	R 110	10-31-44	Grant's Dairy	1.0325	4.3	9.01	13.31	C	136,000	
17641	R 165	12-20-44	Grant's Dairy	1.0327	3.4	8.87	12.27	C	43,000	
17908	R 229	2-7-45	Grant's Dairy	1.0330	3.5	8.96	12.46	C	124,000	
18045	R 263	3-1-45	Grant's Dairy	1.0319	3.9	8.77	12.67	S	103,000	
18239	R 318	4-17-45	Grant's Dairy	1.0318	3.7	8.70	12.40	S	63,000	
16772	R 290	6-28-44	Higgins Dairy	1.0324	4.4	9.00	13.40	S	250,000	
17493	R 103	10-31-44	Higgins Dairy	1.0323	4.1	8.91	13.01	C	190,000	
17637	R 161	12-20-44	Higgins Dairy	1.0326	3.6	8.88	12.48	S	282,000	
18248	R 327	4-17-45	Higgins Dairy	1.0314	3.5	8.56	12.06	S	98,000	
16778	R 296	6-28-44	Jones, Austin	1.0319	3.9	8.76	12.66	S	18,000	
17499	R 109	10-31-44	Jones, Austin	1.0332	4.7	9.27	13.97	C	4,000	
17897	R 218	2-7-45	Jones, Austin	1.0324	4.4	9.00	13.40	C	9,000	
18059	R 277	3-1-45	Jones, Austin	1.0323	4.3	8.96	13.26	S	29,000	
18238	R 317	4-17-45	Jones, Austin	1.0325	4.3	9.03	13.33	S	3,000†	
16773	R 291	6-28-44	Kenduskeag Valley Co-op. Creamery	1.0305	3.6	8.36	11.96	U	165,000	
6756	R 274	6-28-44	Kingsbury's Dairy	1.0311	3.8	8.55	12.35	S	13,000	
17892	R 213	2-7-45	Kingsbury's Dairy	1.0320	3.8	8.77	12.57	S	93,000	
18042	R 260	3-1-45	Kingsbury's Dairy	1.0323	3.9	8.87	12.77	S	18,000	
17667	R 285	6-28-44	Morrison, A. D. & R. V.	1.0311	4.3	8.65	12.95	U	126,000	
17636	R 160	12-20-44	Morrison, A. D. & R. V.	1.0326	3.8	8.92	12.72	S	386,000	
18247	R 326	4-17-45	Morrison, A. D. & R. V.	1.0326	3.9	8.94	12.84	S	1,000,000†	
16770	R 288	6-28-44	Perry, J. Francis	1.0311	3.7	8.53	12.23	S	260,000	Underpasteurized
18048	R 266	3-1-45	Perry, J. Francis	1.0308	3.6	8.43	12.03	S	612,000	
16776	R 294	6-28-44	Perry, N. Searle	1.0305	3.8	8.40	12.20	C	1,206,000	
17893	R 214	2-7-45	Perry, N. Searle	1.0322	4.3	8.93	13.23	U	211,000	
16761	R 279	6-28-44	Pine State Dairy	1.0320	4.0	8.81	12.81	C	193,000	
17101	R 47	8-15-44	Pine State Dairy	1.0332	3.5	9.01	12.51	S	952,000	Underpasteurized
17272	R 69	9-13-44	Pine State Dairy	1.0323	4.0	8.89	12.89	U	252,000	
17496	R 103	10-31-44	Pine State Dairy	1.0324	4.5	9.02	13.52	C	1,016,000	
17640	R 164	12-20-44	Pine State Dairy	1.0337	3.8	9.20	13.00	U	80,000	
17894	R 215	2-7-45	Pine State Dairy	1.0317	3.9	8.72	12.62	S	700,000	
18055	R 273	3-1-45	Pine State Dairy	1.0335	3.8	9.15	12.95	U	230,000	
18242	R 321	4-17-45	Pine State Dairy	1.0320	3.5	8.71	12.21	S	118,000	
BAR HARBOR										
16553	R 264	5-5-44	Kelley, Hugh N.	1.0288	3.7	7.95	11.65	C	111,000	Below standard in total solids
16035	S 296	5-25-44	Kelley, Hugh N.	1.0313	4.1	8.66	12.76	C	16,000	Sediment test on one-half pint
17077	S 75	8-10-44	Kelley, Hugh N.	1.0295	4.2	8.23	12.43	C	201,000	Underpasteurized
17034	S 82	8-10-44	Kelley, Hugh N.	1.0326	4.3	9.03	13.33	U	181,000	
17800	R 201	1-25-45	Kelley, Hugh N.	1.0314	4.9	8.84	13.74	C	309,000	Underpasteurized
16557	R 268	5-5-44	Mt. Desert Island Dairies, Inc.	1.0303	3.9	8.37	12.27	C	5,000	
16633	S 294	5-25-44	Mt. Desert Island Dairies, Inc.	1.0301	3.9	8.32	12.22	C	6,000	Sediment test on one-half pint
17081	S 79	8-10-44	Mt. Desert Island Dairies, Inc.	1.0305	3.9	8.42	12.32	C	10,000	
17082	S 80	8-10-44	Mt. Desert Island Dairies, Inc.	1.0315	3.9	8.67	12.57	C	3,000	
17793	R 194	1-25-45	Mt. Desert Island Dairies, Inc.	1.0319	4.4	8.87	13.27	C	6,000	

† Less than.

‡ Greater than.

Table showing the results of the analyses of samples of pasteurized milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count--Colonies per c.c.	Remarks
BATH										
16690	FS 447	6-14-44	Oakhurst Dairy Co.	1.0330	3.3	8.92	12.22	U	3,000	
16691	FS 448	6-14-44	Oakhurst Dairy Co.	1.0330	3.5	8.93	12.46	U	13,000	
18110	H 201	3-16-45	Oakhurst Dairy Co.	1.0330	3.8	9.02	12.82	C	48,000	
18111	H 202	3-16-45	Oakhurst Dairy Co.	1.0330	3.8	9.02	12.82	S	84,000	
18112	H 203	3-16-45	Oakhurst Dairy Co.	1.0330	3.8	9.02	12.82	S	72,000	
BELFAST										
10658	S 297	6-13-44	Keene, F. H.	1.0323	4.0	8.89	12.89	S	74,000	
17224	S 95	9-7-44	Keene, F. H.	1.0329	3.6	8.95	12.55	C	1,206,000	
17757	S 308	1-23-45	Keene, F. H.	1.0320	4.2	8.85	13.05	U	3,000†	
18258	S 391	4-20-45	Keene, F. H.	1.0290	3.7	8.00	11.70	S	3,000†	Below standard in total solids
10662	S 301	6-13-44	Round Top Farms	1.0320	3.9	8.79	12.69	S	3,000†	
17227	S 99	9-7-44	Round Top Farms	1.0311	3.7	8.53	12.23	C	3,000†	
17753	S 307	1-23-45	Round Top Farms	1.0322	4.6	8.99	13.59	S	3,000†	
18256	S 389	4-20-45	Round Top Farms	1.0324	4.0	8.91	12.91	S	3,000†	
BELGRADE										
10850	FS 6†	7-12-44	Hood & Sons, Inc., H. P.	1.0310	4.2	8.60	12.80	S	1,079,000	
BETHEL										
16831	FS 511	6-29-44	Bennett, E. E.	1.0311	4.4	8.67	13.07	C	389,000	
16802	FS 512	6-29-44	Bennett, E. E.	1.0321	4.2	8.88	13.08	S	86,000	Sediment test on one-half pint
BIDDEFORD and SACO										
16910	AJ 14	7-20-44	Biddeford Dairy	1.0296	3.9	8.19	12.09	S	12,000	
17192	AJ 92	8-10-44	Biddeford Dairy	1.0290	3.8	8.02	11.82	S	52,000	
16897	AJ 1	7-20-44	Cole Farm Dairy	1.0323	4.2	8.93	13.13	C	4,000	
17460	AJ 164	10-27-44	Cole Farm Dairy	1.0315	5.1	8.92	14.02	C	15,000	
17697	AJ 97	8-10-44	Fenderson, G. H.	1.0310	4.0	8.56	12.56	S	40,000	
16907	AJ 11	7-20-44	Hood & Sons, Inc., H. P.	1.0315	3.9	8.67	12.57	S	53,000	
16646	AJ 241	5-27-44	Ladd, Everett	1.0320	4.0	8.88	13.13	S	3,000†	
16902	AJ 6	7-20-44	Ladd, Everett	1.0317	4.0	8.74	12.74	U	51,000	10-ounce container
17095	AJ 95	8-10-44	Ladd, Everett	1.0308	3.9	8.49	12.39	U	15,000	Sediment test on one-half pint
17096	AJ 96	8-10-44	Ladd, Everett	1.0313	3.9	8.62	12.52	S	14,000	
17447	AJ 163	10-26-44	Ladd, Everett	1.0314	4.3	8.72	13.02	U	5,000	No phosphatase test made
17475	AJ 170	10-27-44	Landry, A.	1.0315	4.1	8.71	12.81	S	53,000	
16645	AJ 245	5-27-44	Landry, W. A.	1.0310	3.7	8.50	12.20	S	28,000	
16912	AJ 16	7-20-44	Landry, W. A.	1.0315	3.8	8.65	12.45	S	16,000	
17094	AJ 94	8-10-44	Landry, W. A.	1.0320	3.8	8.77	12.57	S	126,000	
17470	AJ 165	10-27-44	Landry, W. A.	1.0321	4.0	8.84	12.84	S	175,000	
16904	AJ 8	7-20-44	Maine Dairy, Inc.	1.0323	3.7	8.83	12.53	C	9,000	
16644	AJ 244	5-27-44	Roberge, Lucien	1.0300	3.5	8.21	11.71	C	24,000	Below standard in total solids
17408	AJ 143	10-25-44	Roberge, Lucien	1.0303	3.7	8.33	12.03	C	50,000	
10899	AJ 3	7-20-44	Thibodeau & Son, H.	1.0323	3.7	8.83	12.53	U	12,000	
17439	AJ 155	10-26-44	Thibodeau & Son, H.	1.0320	3.8	8.77	12.57	U	220,000	

† Less than.

Table showing the results of the analyses of samples of pasteurized milk

Inspector's number		Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count--Colonies per c.c.	Remarks
BLUEHILL										
03	S 61	8- 9-44	Austin, Mrs. William	1.0320	4.1	8.83	12.93	S	3,000†	
BRUNSWICK										
29	FS 474	6-15-44	Bisson, Arthur	1.0323	4.0	9.61	13.61	S	28,000	
11	H 94	2- 9-45	Bisson, Arthur	1.0325	4.2	8.98	13.18	S	105,000	
24	H 178	2-23-45	Bisson, Arthur	1.0318	3.8	8.72	12.52	U	51,000	
12	FS 457	6-15-44	Dionne, M. J.	1.0344	4.8	9.58	14.38	S	8,000	
10	H 93	2- 9-45	Dionne, M. J.	1.0322	4.5	8.97	13.47	S	98,000	
16	FS 461	6-15-44	Granite Farm Dairy	1.0309	4.4	8.61	13.01	C	250,000	
17	FS 462	6-15-44	Granite Farm Dairy	1.0306	4.2	8.50	12.70	C	9,000	
12	H 95	2- 9-45	Granite Farm Dairy	1.0309	4.5	8.64	13.14	U	9,000	
26	H 180	2-23-45	Granite Farm Dairy	1.0323	4.2	8.93	13.13	U	138,000	
00	H 191	3-15-45	Granite Farm Dairy	1.0320	4.0	8.81	12.81	S	12,000	
01	H 192	3-15-45	Granite Farm Dairy	1.0329	4.5	9.15	13.65	S	780,000	
23	FS 468	6-15-44	Hood & Sons, Inc., H. P.	1.0320	4.1	8.83	12.93	C	3,000†	
24	FS 469	6-15-44	Hood & Sons, Inc., H. P.	1.0308	3.9	8.49	12.39	S	4,000	Sediment test on one-half pint
22	H 105	2-10-45	Hood & Sons, Inc., H. P.	1.0315	4.0	8.69	12.69	S	3,000†	
22	H 213	3-28-45	Hunt, Donald	1.0323	4.1	8.91	13.01	C	90,000	Sediment test on ½ pint
23	H 214	3-28-45	Hunt, Donald	1.0322	4.0	8.86	12.86	U	17,000	
13	H 96	2- 9-45	Oakhurst Dairy Co.	1.0319	4.1	8.81	12.91	U	28,000	
22	FS 467	6-15-44	Sandelin, H. S.	1.0329	4.0	9.03	13.03	S	344,000	
14	H 99	2- 9-45	Sandelin, H. S.	1.0330	4.6	9.19	13.79	S	16,000	
BUCKSPORT										
31	2 86	10-25-44	Footman's Dairy	1.0315	4.3	8.75	13.05	S	29,000	
21	2 185	1-12-45	Footman's Dairy	1.0325	4.1	8.96	13.06	C	43,000	
CAMDEN										
75	S 331	6-16-44	Cripps, R. W.	1.0310	4.3	8.62	12.92	C	18,000	
95	S 347	2-22-45	Cripps, R. W.	1.0329	4.6	9.17	13.77	S	10,000	
00	S 393	4-25-45	Cripps, R. W.	1.0325	4.5	9.05	13.55	S	36,000	
79	S 335	6-16-44	Nash & Son, H. H.	1.0333	4.3	9.29	13.49	S	136,000	
07	S 323	1-26-45	Nash & Son, H. H.	1.0327	4.5	9.10	13.60	U		Underpasteurized
96	S 348	2-22-45	Nash & Son, H. H.	1.0335	4.3	9.26	13.56	S	172,000	
31	S 394	4-25-45	Nash & Son, H. H.	1.0322	4.3	8.93	13.23	U	1,000,000†	No bacteria count made. No phosphatase test made
37	S 333	6-16-44	Round Top Farms	1.0317	4.0	8.74	12.74	S	3,000†	
CARIBOU										
95	R 9	7-20-44	Katahdin Creamery Co.	1.0312	3.8	8.57	12.37	C	3,000†	
06	R 10	7-20-44	Katahdin Creamery Co.	1.0312	3.9	8.59	12.49	C	3,000†	
14	R 243	2-23-45	Katahdin Creamery Co.	1.0326	4.0	8.96	12.96	S	4,000	
08	R 297	4- 5-45	Katahdin Creamery Co.	1.0311	3.5	8.49	11.99	S	123,000	
09	R 298	4- 5-45	Katahdin Creamery Co.	1.0320	3.7	8.75	12.45	U	126,000	
10	R 299	4- 5-45	Katahdin Creamery Co.	1.0327	4.2	9.03	13.23	U	44,000	
11	R 300	4- 5-45	Katahdin Creamery Co.	1.0320	4.0	8.81	12.81	U	10,000	

Less than.
Greater than.

Table showing the results of the analyses of samples of pasteurized milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count--Colonies per c.c.	Remarks
DAMARISCOTTA										
16097	FS 454	6-14-44	Round Top Farms	1.0318	4.1	8.78	12.88	S	9,000	
EASTPORT										
16975	S 47	7-27-44	Humphries, A. C.	1.0317	4.0	8.74	12.74	U	656,000	No sediment test Added water No sediment test
17320	S 167	10- 3-44	Humphries, A. C.	1.0270	4.2	7.54	11.74		5,000	
17321	S 168	10- 3-44	Humphries, A. C.	1.0320	4.5	8.92	13.42		12,000	
ELLSWORTH										
16020	S 282	5-24-44	Estey, S. S.	1.0313	4.3	8.70	13.00	C	3,000	No bacteria count Sediment test on one-half pint
17067	S 65	8- 9-44	Estey, S. S.	1.0305	4.0	8.44	12.44	C	6,000	
17335	S 182	10- 4-44	Estey, S. S.	1.0317	4.5	8.84	13.34	C		
17165	S 84	8-24-44	Hancock County Creamery	1.0320	4.1	8.83	12.93	C	42,000	
17613	S 248	11-30-44	Hancock County Creamery	1.0330	4.3	9.13	13.43	C	18,000	
FARMINGTON										
16884	FS 32	7-13-44	Pillsbury, John R.	1.0315	4.6	8.81	13.41	C	22,000	
16885	FS 33	7-13-44	Pillsbury, John R.	1.0314	4.6	8.78	13.38	S	20,000	
17276	S 131	9-19-44	Pillsbury, John R.	1.0330	4.8	9.23	14.03	S	572,000	
FORT FAIRFIELD										
16887	R 1	7-20-44	Katahdin Creamery Co.	1.0312	4.2	8.40	12.60	S	284,000	Underpasteurized
16888	R 2	7-20-44	Katahdin Creamery Co.	1.0320	4.1	8.58	12.68	U	93,000	
16889	R 3	7-20-44	Katahdin Creamery Co.	1.0320	4.0	8.81	12.81	U	22,000	
17060	R 40	8- 9-44	Katahdin Creamery Co.	1.0305	4.2	8.48	12.68	S	20,000	
GARDINER										
16734	FS 479	6-15-44	Gardiner, R. H.	1.0324	4.3	8.98	13.28	C	47,000	No bacteria count
17205	FS 143	9- 2-44	Gardiner, R. H.	1.0319	5.0	8.98	13.98	U	35,000	
17847	H 62	1-26-45	Gardiner, R. H.	1.0325	4.0	8.94	12.94	U		
17872	H 78	2- 3-45	Gardiner, R. H.	1.0334	4.3	9.23	13.53	S	24,000	
18197	H 278	4- 5-45	Gardiner, R. H.	1.0319	4.0	8.79	12.79	S	118,000	
HAMPDEN										
18227	R 316	4-11-45	Grant's Dairy	1.0316	4.0	8.71	12.71	S	53,000	Underpasteurized
17271	R 68	9-13-44	Perry, J. Francis	1.0301	3.7	8.23	11.93	S	520,000	
17495	R 105	10-31-44	Perry, J. Francis	1.0323	3.9	8.82	12.72	U	120,000	
17639	R 163	12-20-44	Perry, J. Francis	1.0327	4.1	9.01	13.11	S	69,000	
17907	R 228	2- 7-45	Perry, J. Francis	1.0322	3.9	8.84	12.74	C	600,000	
18243	R 322	4-17-45	Perry, J. Francis	1.0305	3.6	8.36	11.96	U	209,000	
17269	R 66	9-13-44	Perry, N. Searle	1.0320	3.9	8.79	12.69	C	698,000	

Table showing the results of the analyses of samples of pasteurized milk

Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count— Colonies per c.c.	Remarks
Hampden—Cont.									
70 R 67	9-13-44	Perry, N. Searle	1.0322	4.1	8.88	12.98	S	416,000	
94 R 104	10-31-44	Perry, N. Searle	1.0320	4.5	8.92	13.42	C	50,000	
38 R 162	12-20-44	Perry, N. Searle	1.0325	4.4	9.05	13.45	S	56,000	
51 R 269	3- 1-45	Perry, N. Searle	1.0320	3.9	8.79	12.69	C	95,000	
45 R 324	4-17-45	Perry, N. Searle	1.0316	3.9	8.69	12.59	S	71,000	
HOULTON									
45 R 25	8- 8-44	Houlton Farms Dairy	1.0308	4.4	8.59	12.99	U	9,000	
09 R 238	2-23-45	Houlton Farms Dairy	1.0333	5.0	9.35	14.35	S	3,000†	
77 R 278	4- 3-45	Houlton Farms Dairy	1.0300	4.0	8.31	12.31	U	3,000†	
KENNEBUNK									
42 AJ 242	5-27-44	Downing & Norman	1.0317	4.2	8.78	12.98	C	10,000	No phosphatase test made
10 AJ 65	7-29-44	Downing & Norman	1.0323	3.4	8.60	12.00	C	404,000	
90 AJ 90	8-10-44	Downing & Norman	1.0298	4.0	8.26	12.26	S	109,000	
91 AJ 91	8-10-44	Downing & Norman	1.0310	4.1	8.58	12.68	S	71,000	Sediment test on one-half pint
KENNEBUNKPORT									
05 AJ 60	7-29-44	Badger Farms	1.0300	3.6	8.23	11.83	C	127,000	
08 AJ 63	7-29-44	Pearson, Philip	1.0320	4.3	8.88	13.18	U	381,000	
KITTERY and ELIOT									
26 AJ 77	8- 4-44	Badger Farms	1.0300	3.9	8.29	12.19	S	1,270,000	
24 AJ 75	8- 4-44	Bartlett & Sons, W. S.	1.0290	3.9	8.04	11.94	S		No bacteria count made
25 AJ 76	8- 4-44	Brackett, Charles W.	1.0316	3.6	8.63	12.23	U		No bacteria count made
19 AJ 70	8- 4-44	Emery, A. H.	1.0315	3.6	8.61	12.21	C	7,000	
27 AJ 78	8- 4-44	Hood & Sons, Inc., H. P.	1.0300	3.7	8.25	11.95	S	90,000	Underpasteurized
22 AJ 73	8- 4-44	Rowan, H. M.	1.0308	3.8	8.47	12.27	C	36,000	
LEWISTON and AUBURN									
23 FS 62	8-16-44	B & B Dairy	1.0322	4.5	8.97	13.47	S	361,000	
78 AJ 134	10-21-44	B & B Dairy	1.0329	4.8	9.20	14.00	S	188,000	
85 AJ 222	1- 3-45	B & B Dairy	1.0335	5.1	9.42	14.52	S	10,000	
54 H 245	3-30-45	B & B Dairy	1.0332	4.1	9.13	13.23	U	57,000	
15 FS 54	8-16-44	Blais Dairy	1.0305	4.0	8.44	12.44	S	407,000	Underpasteurized
88 AJ 202	11-21-44	Blais Dairy	1.0310	4.0	8.56	12.56	C	78,000	
81 AJ 218	1- 3-45	Blais Dairy	1.0318	4.1	8.78	12.88	S	318,000	
33 H 224	3-29-45	Blais Dairy	1.0329	3.8	9.00	12.80	C	1,100,000	
24 FS 63	8-16-44	Briggs, E. W.	1.0314	4.0	8.66	12.66	S		No bacteria count made
81 AJ 137	10-21-44	Briggs, E. W.	1.0320	4.0	8.81	12.81	C	64,000	
79 AJ 193	11-21-44	Briggs, E. W.	1.0329	4.2	9.08	13.28	S	77,000	
52 H 243	3-30-45	Briggs, E. W.	1.0320	3.7	8.75	12.45	U	3,000†	
21 FS 60	8-16-44	Caron, Charles	1.0304	3.8	8.37	12.17	U	177,000	
97 AJ 227	1- 4-45	Caron, Charles	1.0330	3.9	9.04	12.94	S	140,000	
82 H 83	2- 7-45	Caron, Charles	1.0323	4.0	8.89	12.89	U	117,000	

Less than.

Table showing the results of the analyses of samples of pasteurized milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
Lewiston and Auburn—Cont.										
18136	H 227	3-29-45	Carón, Charles	1.0321	3.4	8.72	12.12	S	9,000	
17156	FS 95	8-19-44	Carroll, C. H.	1.0316	4.3	8.77	13.07	C	34,000	
17583	AJ 197	11-21-44	Carroll, C. H.	1.0320	4.4	8.90	13.30	S	33,000	
17705	AJ 235	1-4-45	Carroll, C. H.	1.0323	4.2	8.93	13.13	S	45,000	
18147	H 238	3-30-45	Carroll, C. H.	1.0327	4.0	8.99	12.99	C	10,000	
17306	AJ 132	10-19-44	Cote's Dairy	1.0323	4.3	8.96	13.26	S	5,000	
17592	AJ 206	11-21-44	Cote's Dairy	1.0319	4.1	8.58	12.69	S	19,000	
17693	AJ 229	1-4-45	Cote's Dairy	1.0320	4.1	8.83	13.63	S	360,000	
18140	H 231	3-29-45	Cote's Dairy	1.0315	3.7	8.03	12.33	C	75,000	
17111	FS 50	8-16-44	Cote's Dairy	1.0309	3.9	8.51	12.41	S	465,000	
17152	FS 91	8-18-44	Drapeau, R. J.	1.0305	4.0	8.29	12.29	C	44,000	Underpasteurized
17593	AJ 207	11-21-44	Drapeau, R. J.	1.0322	3.7	8.80	12.50	C	53,000	
17687	AJ 224	1-3-45	Drapeau, R. J.	1.0234	3.6	6.48	10.06	C	180,000	No sediment test Grossly underpasteurized. Below standard total solids. Added water
17739	AJ 237	1-16-45	Drapeau, R. J.	1.0319	3.9	8.77	12.67	S	31,000	
17740	AJ 238	1-13-45	Drapeau, R. J.	1.0318	3.9	8.74	12.64	S	23,000	
18143	H 234	3-29-45	Drapeau, R. J.	1.0317	3.9	8.72	12.62	S	170,000	
17120	FS 59	8-16-44	Dumont & Co., E.	1.0320	3.6	8.73	12.33	S	2,608,000	
17356	AJ 112	10-19-44	Dumont & Co., E.	1.0322	4.1	8.83	12.93	S	202,000	
17590	AJ 204	11-21-44	Dumont & Co., E.	1.0319	3.9	8.76	12.66	C	116,000	
17680	AJ 217	1-3-45	Dumont & Co., E.	1.0332	3.7	9.05	12.75	S	58,000	
17376	AJ 132	10-21-44	Four Oaks Dairy	1.0328	4.6	9.14	13.74	C	27,000	
17150	FS 89	8-18-44	Hood & Sons, Inc., H. P.	1.0305	4.2	8.48	12.68	C	16,000	
17151	FS 90	8-18-44	Hood & Sons, Inc., H. P.	1.0305	4.4	8.47	12.87	S	10,000	
17575	AJ 189	11-21-44	Hood & Sons, Inc., H. P.	1.0310	4.3	8.62	12.92	C	3,000†	
17576	AJ 190	11-21-44	Hood & Sons, Inc., H. P.	1.0313	4.1	8.66	12.76	C	3,000†	
18135	H 216	3-29-45	Kinner Dairy	1.0325	3.4	9.33	12.73	S	61,000	
17133	FS 72	8-18-44	LaFrance, Joseph	1.0310	3.9	8.54	12.44	S	69,000	
17678	AJ 215	1-3-45	LaFrance, Joseph	1.0323	4.5	9.00	13.50	S	184,000	
17986	H 164A	2-21-45	LaFrance, Joseph	1.0320	4.0	8.81	12.81	S	1,000,000†	
18137	H 223	3-29-45	LaFrance, Joseph	1.0323	3.7	8.83	12.53	C	953,000	
17117	FS 56	8-16-44	Laneville, Henry	1.0313	4.1	8.66	12.76	C	97,000	
17586	AJ 200	11-21-44	Laneville, Henry	1.0323	3.4	8.77	12.17	U	46,000	
17684	AJ 221	1-3-45	Laneville, Henry	1.0318	4.1	8.78	12.88	S	3,000†	Grossly underpasteurized
17744	AJ 242	1-13-45	Laneville, Henry	1.0318	3.8	8.72	12.62	C	145,000	Grossly underpasteurized
18129	H 220	3-29-45	Laneville, Henry	1.0319	3.6	8.71	12.31	C	15,000	
17127	FS 66	8-16-44	Lever's Dairy	1.0316	4.6	8.83	13.43	C	63,000	Sediment test on one-half pint
17591	AJ 205	11-21-44	Lever's Dairy	1.0333	4.5	9.25	13.75	S	59,000	
17698	AJ 228	1-4-45	Lever's Dairy	1.0332	4.3	9.18	13.48	S	8,000	
18138	H 229	3-29-45	Lever's Dairy	1.0322	4.1	9.13	13.23	C	3,000	
17139	FS 78	8-18-44	Macomber's Dairy	1.0310	3.9	8.54	12.44	S	11,000	
17140	FS 79	8-18-44	Macomber's Dairy	1.0313	4.0	8.64	12.64	S	635,000	
17584	AJ 198	11-21-44	Macomber's Dairy	1.0310	3.8	8.52	12.32	U	47,000	Underpasteurized
17700	AJ 230	1-4-45	Macomber's Dairy	1.0329	4.6	9.16	13.76	S	9,000	
17701	AJ 231	1-4-45	Macomber's Dairy	1.0330	5.0	9.27	14.27	S	8,000	
17113	FS 52	8-16-44	Malenfant, A. J.	1.0310	4.4	8.64	13.04	U	217,000	
18127	H 218	3-29-45	Malenfant, A. J.	1.0318	3.6	8.68	12.28	S	50,000	
17126	FS 65	8-16-44	Mottram, George	1.0305	3.8	8.40	12.20	S	2,540,000	
17380	AJ 186	10-21-44	Mottram, George	1.0334	4.0	9.16	13.16	C	700,000	
17577	AJ 191	11-21-44	Mottram, George	1.0324	4.4	9.00	13.40	C	115,000	
17704	AJ 234	1-4-45	Mottram, George	1.0330	4.2	9.11	13.31	C	288,000	
18151	H 242	3-30-45	Mottram, George	1.0325	4.2	8.98	13.18	S	1,270,000	

† Less than.

‡ Greater than.

Table showing the results of the analyses of samples of pasteurized milk

Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
Lewiston and Auburn—Cont.									
FS 87	8-18-44	White, H. S.	1.0310	4.7	8.70	13.40	S		No bacteria count made. No phosphatase test made
AJ 138	10-21-44	White, H. S.	1.0344	4.5	9.52	14.02	S	82,000	
AJ 194	11-21-44	White, H. S.	1.0319	4.3	8.85	13.15	S	31,000	
AJ 232	1- 4-45	White, H. S.	1.0320	4.4	8.90	13.30	S	3,000†	
FS 98	8-19-44	Wiseman Farms	1.0303	4.0	8.39	12.39	S	70,000	Sediment test on one-half pint
AJ 214	1- 3-45	Wiseman Farms	1.0317	4.0	8.74	12.74	S	12,000	Sediment test on one-half pint
LISBON FALLS									
II 87	2- 7-45	Griffin & Son, H. L.	1.0323	4.1	8.91	13.01	S	3,000†	
LIVERMORE FALLS									
FS 531	6-30-44	Chicoine, Ernest	1.0330	4.3	9.13	13.43	C	9,725,000	
CO 50	11-16-44	LaFreniere, Romeo	1.0340	4.6	9.44	14.04	U	7,000	
FS 533	6-30-44	Tardiff, John	1.0323	4.7	9.04	13.74	C	9,000	
FS 35	7-29-44	Tardiff, John	1.0335	4.3	9.26	13.56	S	26,000	
CO 48	11-16-44	Tardiff, John	1.0325	4.2	8.98	13.18	S	118,000	
MADISON and ANSON									
S 103	9- 8-44	Hilton Dairy	1.0325	4.6	9.07	13.67	S	9,000	
S 208	12-21-44	Hilton Dairy	1.0328	4.8	9.18	13.98	S	3,000†	
S 104	9- 8-44	Ouellette, A. H.	1.0338	4.5	9.37	13.87	U	30,000	
S 209	12-21-44	Ouellette, A. H.	1.0328	4.7	9.16	13.86	C	7,000	
MEXICO									
FS 521	6-30-44	Ferland's Dairy	1.0317	4.3	8.80	13.10	C	1,016,000	
FS 522	6-30-44	Ferland's Dairy	1.0325	4.4	9.03	13.43	S	30,000	
CO 47	11-16-44	Ferland's Dairy	1.0325	4.5	9.05	13.55	S	364,000	Sediment test on ½ pint
MOUNT DESERT									
R 207	1-25-45	Blanchard, M. D.	1.0325	5.1	9.17	14.27	U	5,000	
NORTHEAST HARBOR									
S 70	8- 9-44	Bordeaux, C. G.	1.0322	3.9	8.84	12.74	U	274,000	
R 204	1-25-45	Mt. Desert Island Dairies, Inc.	1.0323	4.4	8.98	13.38	S	4,000	
NORWAY									
FS 493	6-29-44	Goodwin & Son, D. W.	1.0320	4.5	8.92	13.42	C	8,000	
AJ 109	10-18-44	Goodwin & Son, D. W.	1.0315	4.7	8.83	13.53	S	71,000	

less than.

Table showing the results of the analyses of samples of pasteurized milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
Norway—Cont.										
17020	AJ 212	12-7-44	Goodwin & Son, D. W.	1.0331	4.4	9.15	13.55	U	3,000†	
17347	AJ 103	10-18-44	Hood & Sons, Inc., H. P.	1.0315	4.5	8.78	13.28	C	3,000†	
OLD TOWN										
17285	R 76	9-19-44	Jones, Austin	1.0330	4.4	9.15	13.55	C	107,000	
17720	R 176	1-10-45	Jones, Austin	1.0320	4.4	8.90	13.30	S	3,000†	
17286	R 77	9-19-44	Littlefield, Rolfe	1.0280	4.0	7.81	11.81	U	126,000	
17717	R 173	1-10-45	Littlefield, Rolfe	1.0319	4.1	8.81	12.91	S	29,000	
17279	R 70	9-19-44	Sutton Farms	1.0310	4.2	8.60	12.80	S	91,000	
ORONO										
17510	R 120	10-31-44	Sutton Farms	1.0320	4.4	8.90	13.30	S	130,000	
17722	R 178	1-10-45	Sutton Farms	1.0325	4.2	8.98	13.18	C	21,000	
ORRINGTON										
17497	R 107	10-31-44	Kingsbury's Dairy	1.0325	4.5	9.05	13.55	S	15,000	
17642	R 166	12-20-44	Kingsbury's Dairy	1.0325	4.4	9.03	13.43	S	10,000	
OXFORD										
16750	FS 484	6-28-44	Foster, Stanley V.	1.0325	4.4	9.00	13.40	C	106,000	
17374	AJ 130	10-21-44	Foster, Stanley V.	1.0344	4.9	9.64	14.54	S	84,000	
17616	AJ 208	12-7-44	Foster, Stanley V.	1.0329	4.7	9.18	13.88	C	17,000	
17618	AJ 210	12-7-44	Hood & Sons, Inc., H. P.	1.0323	4.2	8.93	13.13	C	3,000†	
PERRY										
16744	R 272	6-24-44	Humphries, A. C.	1.0320	4.1	8.83	12.93		66,000	No sediment test m
16745	R 273	6-24-44	Humphries, A. C.	1.0320	4.1	8.83	12.93	S	106,000	
17606	S 241	11-21-44	Humphries, A. C.	1.0805	4.4	8.52	12.92		9,000	No sediment test m
PRESQUE ISLE										
18017	R 246	2-23-45	Katahdin Creamery Co.	1.0317	4.2	8.78	12.98	S	48,000	
16951	R 11	7-22-44	Ramsdell, P. A.	1.0313	3.4	8.52	11.92	C	107,000	Sediment test on one-half pint
16952	R 12	7-22-44	Ramsdell, P. A.	1.0318	3.9	8.74	12.64	S	1,080,000	
17299	S 146	9-29-44	Ramsdell, P. A.	1.0314	3.7	8.60	12.30	C	5,000	
18016	R 245	2-23-45	Ramsdell, P. A.	1.0317	3.9	8.72	12.62	C	23,000	
18214	R 303	4-6-45	Ramsdell, P. A.	1.0318	3.5	8.54	12.04	S		No bacteria count
RANGELEY										
16993	FS 39	7-29-44	Ferland's Dairy	1.0313	4.0	8.64	12.64	S	1,587,000	

† Less than.

Table showing the results of the analyses of samples of pasteurized milk

Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count— Colonies per c.c.	Remarks	
ROCKLAND										
S 316	6-14-44	Anderson & Sons, Julius	1.0318	4.6	8.88	13.48	S	11,000	Sediment test on one-half pint Sediment test on one-half pint	
S 331	1-26-45	Anderson & Sons, Julius	1.0324	4.5	9.02	13.52	S	3,000†		
S 335	1-27-45	Anderson & Sons, Julius	1.0325	4.4	9.03	13.43	C	11,000		
S 417	4-27-45	Anderson & Sons, Julius	1.0323	4.0	8.89	12.89	U	1,000,000†		
S 322	1-24-45	Round Top Farms	1.0314	4.2	8.70	12.90	U	3,000†		
S 353	2-22-45	Round Top Farms	1.0324	4.6	9.04	13.64	U	3,000†		
S 402	4-25-45	Round Top Farms	1.0322	4.2	8.90	13.10	S	7,000		
RUMFORD										
FS 516	6-30-44	Breau's Dairy	1.0313	4.2	8.68	12.88	S	243,000		
CO 44	11-16-44	Breau's Dairy	1.0317	4.5	8.84	13.34	S	70,000		
FS 519	6-30-44	Hood & Sons, Inc., H. P.	1.0315	4.3	8.75	13.05	S	3,000†		
S 133	9-19-44	Hood & Sons, Inc., H. P.	1.0310	4.1	8.58	12.68	S	10,000		
CO 46	11-16-44	Hood & Sons, Inc., H. P.	1.0320	4.2	8.85	13.05	S	7,000		
SANFORD										
AJ 41	7-21-44	Sanford Dairy	1.0313	3.9	8.62	12.52	U	15,000		
AJ 50	7-21-44	Shaw, H. J.	1.0325	4.1	8.96	13.06	S	20,000		
SKOWHEGAN										
S 92	9-6-44	North Yarmouth Dairy	1.0316	4.4	8.79	13.19	C	6,000	No bacteria count made	
S 259	12-19-44	Spring Farm Dairy	1.0320	4.5	8.92	13.42	U			
SOUTH PORTLAND										
AJ 186	10-28-44	Dean, Charles R.	1.0320	4.2	8.85	13.05	C	3,000†		
AJ 140	10-25-44	Portland Farms	1.0323	4.5	9.00	13.50	S	4,000		
AJ 185	10-28-44	Portland Farms	1.0324	4.5	9.02	13.52	C	42,000		
SOUTHWEST HARBOR										
S 292	5-25-44	Blanchard, M. D.	1.0323	4.4	8.98	13.38	C	8,000	No bacteria count made	
S 67	8-9-44	Blanchard, M. D.	1.0310	4.3	8.62	12.92	U			
S 279	5-24-44	Clark, Owen J., Jr.	1.0323	4.3	8.96	13.26	S	11,000		
R 271	5-5-44	Hancock County Creamery	1.0327	4.2	9.03	13.23	C	13,000		
R 205	1-25-45	Hancock County Creamery	1.0333	4.6	9.27	13.87	S	15,000		
R 206	1-25-45	Mt. Desert Island Dairies, Inc.	1.0323	4.3	8.96	13.26	U	60,000		
TOPSHAM										
H 208	3-28-45	Bisson, Arthur	1.0305	3.8	8.40	12.20	C	147,000		
H 209	3-28-45	Bisson, Arthur	1.0319	3.9	8.77	12.67	C	72,000		

less than.
greater than.

Table showing the results of the analyses of samples of pasteurized milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
WATERVILLE and FAIRFIELD										
16749	S 338	6-21-44	Fairfield Creamery Co.	1.0315	3.9	8.67	12.57	S	40,000	
16743	S 339	6-21-44	Fairfield Creamery Co.	1.0313	5.7	8.99	14.69	S	640,000	
17695	S 296	1-4-45	Fairfield Creamery Co.	1.0325	4.0	8.94	12.94	S	28,000	
17292	S 139	9-21-44	Maple Leaf Farms	1.0338	3.7	9.15	12.85	C	14,000	
17862	S 275	12-21-44	Maple Leaf Farms	1.0330	3.8	9.02	12.82	C	19,000	
17255	S 127	9-13-44	Webber's Dairy	1.0330	3.5	8.96	12.46	C	3,238,000	
17876	S 289	1-3-45	Webber's Dairy	1.0333	3.8	8.30	12.10	S		No bacteria count
WESTBROOK										
16650	AJ 250	6-7-44	Grondin, R. J.	1.0315	3.8	8.65	12.45	S	15,000	
16649	AJ 249	6-7-44	Hood & Sons, Inc., H. P.	1.0315	3.8	8.65	12.45	S	20,000	
16648	AJ 248	6-7-44	Oakhurst Dairy Co.	1.0313	4.0	8.64	12.64	S	9,000	
16656	AJ 257	6-7-44	Old Tavern Farm, Inc.	1.0327	3.8	9.05	12.85	S	6,000	
WOODSTOCK										
16794	FS 504	6-29-44	Hemingway, John	1.0311	4.5	8.69	13.19	C	187,000	
YARMOUTH										
18092	H 183	3-15-45	Hilton, F. L.	1.0311	4.0	8.59	12.59	U	454,000	
YORK										
17028	AJ 79	8-4-44	Blaisdell Bros.	1.0303	3.5	8.29	11.79	S	464,000	
17030	AJ 81	8-4-44	Moulton, R. B. H.	1.0303	3.5	8.29	11.79	S		No bacteria count

Table showing the results of the analyses of samples of raw milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
ALFRED										
16947 AJ 51		7-21-44	Burbank, Forrest T.	1.0315	5.6	9.02	14.62	C	83,000	
16948 AJ 52		7-21-44	Roberts & Son, J. E.	1.0325	4.6	9.07	13.67	C	11,000	
AUGUSTA										
16581 FS 401		5-9-44	Albert, Rene	1.0327	4.2	9.03	13.23	C	32,000	
17200 FS 138		9-2-44	Ayotte, George	1.0323	4.4	8.98	13.38	S	4,000	
17767 H 18		1-24-45	Ayotte, George	1.0320	4.6	8.94	13.54	U	11,000	
18160 H 251		3-31-45	Ayotte, George	1.0316	4.0	8.71	12.71	C	3,000†	
17201 FS 139		9-2-44	Ayotte, Richard	1.0318	4.7	8.90	13.60	S	50,000	
17768 H 19		1-24-45	Ayotte, Richard	1.0316	4.4	8.79	13.19	U	280,000	
17935 H 118		2-12-45	Ayotte, Richard	1.0310	4.1	8.58	12.68	S		No bacteria count made
18161 H 252		3-31-45	Ayotte, Richard	1.0312	3.7	8.55	12.25	C	11,000	
16562 FS 382		5-9-44	Ballard, Harry	1.0311	4.5	8.69	13.19	S	16,000	
17859 H 65		1-27-45	Bean, Harold T.	1.0336	5.3	9.48	14.78	C	7,000	
16553 FS 383		5-9-44	Bean & Sons, W. F.	1.0302	5.0	8.56	13.56	S	29,000	
17766 H 17		1-24-45	Bean & Sons, W. F.	1.0330	4.5	9.17	13.67	S	7,000	
17773 H 24		1-24-45	Beaulieu, Antonio	1.0315	4.3	8.75	13.05	U	105,000	
18163 H 254		3-31-45	Beaulieu, Antonio	1.0312	3.9	8.59	12.49	U	303,000	
18234 H 286		4-13-45	Beaulieu, Antonio	1.0320	4.0	8.81	12.81	U		No bacteria count made
16567 FS 387		5-9-44	Beaulieu, Isidore	1.0312	4.1	8.63	12.73	S	698,000	
17190 FS 128		9-1-44	Beaulieu, Isidore	1.0307	3.8	8.45	12.25	U		No bacteria count made
17939 H 122		2-12-45	Beaulieu, Isidore	1.0312	4.0	8.61	12.61	U		No bacteria count made
16569 FS 389		5-9-44	Beland, Antonio	1.0323	3.7	8.83	12.53	S	17,000	
17175 FS 113		8-30-44	Beland, Antonio	1.0318	4.8	8.92	13.72	S	102,000	
17829 H 44		1-26-45	Beland, Antonio	1.0327	3.7	8.93	12.63	U	37,000	
18229 H 281		4-13-45	Beland, Antonio	1.0309	4.4	8.62	13.02	S		No bacteria count made
17828 H 43		1-26-45	Bendall, John	1.0327	4.9	9.18	14.08	U	9,000	
16585 FS 405		5-10-44	Benner, George	1.0324	4.4	9.00	13.40	C	674,000	
17183 FS 121		8-30-44	Benner, George	1.0313	3.8	8.60	12.40	S	61,000	
17821 H 36		1-26-45	Benner, George	1.0345	4.2	9.49	13.69	S	63,000	
18231 H 283		4-13-45	Benner, George	1.0338	3.8	9.22	13.02	C		No bacteria count made
16570 FS 390		5-9-44	Blouin, Joseph D.	1.0323	4.3	8.95	13.25	S	20,000	
17189 FS 127		9-1-44	Blouin, Joseph D.	1.0307	3.7	8.43	12.13	C	214,000	
17762 H 13		1-24-45	Blouin, Joseph D.	1.0318	4.0	8.76	12.76	S	93,000	
17933 H 116		2-12-45	Blouin, Joseph D.	1.0322	4.1	8.88	12.98	S		No bacteria count made
18172 H 263		3-31-45	Blouin, Joseph D.	1.0321	3.9	8.82	12.72	S	250,000	
17174 FS 112		8-30-44	Bonenfant, Laurier	1.0309	5.2	8.75	13.95	U	113,000	
17830 H 45		1-26-45	Bonenfant, Laurier	1.0315	4.8	8.85	13.65	U	125,000	
17943 H 126		2-14-45	Bonenfant, Laurier	1.0315	4.6	8.81	13.41	U	387,000	
16566 FS 386		5-9-44	Brewer, Fred	1.0321	4.9	9.03	13.93	S	31,000	
17179 FS 117		8-30-44	Brewer, Fred	1.0290	4.8	8.22	13.02	S	95,000	
17776 H 27		1-24-45	Brewer, Fred	1.0320	4.4	8.90	13.30	U	76,000	
17944 H 127		2-14-45	Brewer, Fred	1.0305	4.3	8.50	12.80	S	40,000	
18167 H 258		3-31-45	Brewer, Fred	1.0321	3.8	8.80	12.60	S	22,000	
17168 FS 106		8-30-44	Chesley, Merle	1.0316	4.8	8.87	13.67	U	223,000	
17184 FS 122		8-30-44	Cote, Arsene	1.0313	5.2	8.89	14.09	C	22,000	
17820 H 35		1-26-45	Cote, Arsene	1.0316	5.0	8.91	13.91	S	3,000	
17936 H 119		2-12-45	Cote, Arsene	1.0317	4.1	8.76	12.86	S		No bacteria count made
17818 H 33		1-26-45	Dostie, Joseph	1.0316	3.0	8.51	11.51	C	19,000	Below standard in fat and total solids
17934 H 117		2-12-45	Dostie, Joseph	1.0320	3.6	8.73	12.33	S		No bacteria count made
18156 H 247		3-31-45	Dostie, Joseph	1.0315	3.2	8.53	11.73	S	87,000	Below standard in fat and total solids
16578 FS 398		5-9-44	Finley, Irwin	1.0305	4.2	8.48	12.68	C	626,000	
17194 FS 132		9-1-44	Finley, Irwin	1.0320	4.1	8.83	12.93	S	132,000	

† Less than.

Table showing the results of the analyses of samples of raw milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
Augusta—Cont.										
17765	H 16	1-24-45	Finley, Irwin	1.0330	4.0	9.06	13.06	S	237,000	
18164	H 255	3-31-45	Finley, Irwin	1.0318	3.8	8.72	12.52	C	188,000	
16575	FS 395	5- 9-44	Fisher, G. B.	1.0315	4.3	8.75	13.05	C	389,000	
17176	FS 114	8-30-44	Fisher, G. B.	1.0315	4.2	8.73	12.93	C	140,000	
17777	H 28	1-24-45	Fisher, Kenneth	1.0338	5.5	9.58	15.08	S	21,000	
18174	H 265	3-31-45	Fisher, Kenneth	1.0303	3.7	8.33	12.03	S	635,000	
16580	FS 400	5- 9-44	Gamage, Harold	1.0325	4.4	9.03	13.43	C	12,000	
17173	FS 111	8-30-44	Gamage, Harold	1.0327	4.4	9.08	13.48	C	3,000	
17769	H 20	1-24-45	Gamage, Harold	1.0324	4.3	8.98	13.28	S	83,000	
17940	H 123	2-12-45	Gamage, Harold	1.0312	4.5	8.71	13.21	S		No bacteria count made
18162	H 253	3-31-45	Gamage, Harold	1.0307	4.3	8.55	12.85	C	3,000†	
16589	FS 409	5-10-44	Goldsmith, Ray C.	1.0315	3.8	8.65	12.45	S	14,000	
17192	FS 130	9- 1-44	Goldsmith, Ray C.	1.0318	3.7	8.95	12.65	S	186,000	
16579	FS 399	5- 9-44	Grover, Merle	1.0315	4.7	8.83	13.53	C	31,000	
17171	FS 109	8-30-44	Grover, Merle	1.0318	4.4	8.84	13.24	C	265,000	
17817	H 32	1-26-45	Grover, Merle	1.0315	4.9	8.87	13.77	C	128,000	
18158	H 249	3-31-45	Grover, Merle	1.0324	4.5	9.02	13.52	S	62,000	
17186	FS 124	8-30-44	Haskell, Herman	1.0332	4.9	9.05	13.95	C	111,000	
16591	FS 411	5-10-44	Lee, M. T.	1.0325	4.3	9.01	13.31	C	5,000	
17167	FS 105	8-30-44	Lee, M. T.	1.0327	4.0	8.99	12.99	C	123,000	
16504	FS 384	5- 9-44	Levesque, Arthur	1.0330	4.4	9.15	13.55	C	199,000	
17177	FS 115	8-30-44	Levesque, Arthur	1.0320	4.5	8.92	13.42	U	223,000	
17774	H 25	1-24-45	Levesque, Arthur	1.0338	4.8	9.43	14.23	S	36,000	
18232	H 284	4-13-45	Levesque, Arthur	1.0329	4.8	9.21	14.01	S		No bacteria count made
17169	FS 107	8-30-44	Lyons, Frank E.	1.0316	4.4	8.79	13.19	S	500,000	
17779	H 30	1-24-45	Lyons, Frank E.	1.0311	4.5	8.69	13.19	C	16,000	
18157	H 248	3-31-45	Lyons, Frank E.	1.0315	4.2	8.73	12.93	U	65,000	
16577	FS 397	5- 9-44	Magee, Tom	1.0335	3.8	9.15	12.95	S	244,000	
17193	FS 131	9- 1-44	Magee, Tom	1.0309	6.0	8.94	14.94	S	184,000	
17827	H 42	1-26-45	Magee, Tom	1.0325	4.9	9.13	14.03	U	9,000	
16571	FS 391	5- 9-44	Peabody, E. A.	1.0325	4.1	8.96	13.06	S	156,000	
17191	FS 129	9- 1-44	Peabody, E. A.	1.0309	3.3	8.39	11.69	C	108,000	Below standard in total solids
17770	H 21	1-24-45	Peabody, E. A.	1.0318	4.0	8.76	12.76	S*	9,000	
18168	H 259	3-31-45	Peabody, E. A.	1.0313	4.1	8.66	12.76	S	18,000	
16565	FS 385	5- 9-44	Quirion, Aime	1.0330	4.0	9.06	13.06	S	377,000	
17178	FS 116	8-30-44	Quirion, Aime	1.0311	4.0	8.59	12.59	S	100,000	
17775	H 26	1-24-45	Quirion, Aime	1.0320	4.7	8.96	13.66	S	17,000	
18233	H 285	4-13-45	Quirion, Aime	1.0320	4.0	8.81	12.81	U		No bacteria count made
16572	FS 392	5- 9-44	Randall, Thomas E.	1.0337	4.5	9.35	13.85	C	54,000	
17162	FS 120	8-30-44	Randall, Thomas E.	1.0321	4.8	9.01	13.81	C	11,000	
17760	H 11	1-24-45	Randall, Thomas E.	1.0335	5.1	9.42	14.52	S	7,000	
18171	H 262	3-31-45	Randall, Thomas E.	1.0330	3.8	9.02	12.82	S	22,000	
16576	FS 396	5- 9-44	Raymond, A. S.	1.0325	4.6	9.07	13.67	C	18,000	
17819	H 34	1-26-45	Raymond, A. S.	1.0335	4.8	9.36	14.16	C	34,000	
18169	H 260	3-31-45	Raymond, A. S.	1.0313	4.7	8.78	13.48	C	115,000	
18230	H 282	4-13-45	Raymond, A. S.	1.0329	4.7	9.19	13.89	S		No bacteria count made
16587	FS 407	5-10-44	Richards, B. R.	1.0335	5.0	9.40	14.40	S	9,000	
17185	FS 123	8-30-44	Richards, B. R.	1.0332	6.0	9.53	15.53	C	22,000	
16588	FS 408	5-10-44	Rodrique, Joseph	1.0325	3.4	8.82	12.22	C	14,000	
17761	H 12	1-24-45	Rodrique, Joseph	1.0307	3.4	8.37	11.77	S	131,000	
17937	H 120	2-12-45	Rodrique, Joseph	1.0301	3.6	8.20	11.86	S		No bacteria count made
18159	H 250	3-31-45	Rodrique, Joseph	1.0306	3.1	8.28	11.38	C	520,000	Below standard in fat and total solids
18235	H 287	4-13-45	Rodrique, Joseph	1.0306	3.5	8.36	11.86	S		No bacteria count made
17180	FS 118	8-30-44	Tanner, B. C.	1.0320	4.4	8.90	13.30	C	48,000	
17826	H 41	1-26-45	Tanner, B. C.	1.0325	4.6	9.07	13.67	C	3,000†	

† Less than.

Table showing the results of the analyses of samples of raw milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
Augusta—Cont.										
3166	H 257	3-31-45	Tanner, B. C.	1.0320	4.3	8.88	13.18	S		No bacteria count made
590	FS 410	5-10-44	Tondreau, Joseph	1.0313	4.2	8.68	12.88	S	1,214,000	
170	FS 108	8-30-44	Tondreau, Joseph	1.0298	4.0	8.25	12.25	S	331,000	
764	H 15	1-24-45	Tondreau, Joseph	1.0318	4.8	8.90	13.70	U	590,000	
945	H 128	2-14-45	Tondreau, Joseph	1.0322	4.6	8.99	13.59	S	309,000	
3155	H 246	3-31-45	Tondreau, Joseph	1.0309	3.4	8.42	11.82	U	1,270,000	
3236	H 288	4-13-45	Tondreau, Joseph	1.0301	3.5	8.24	11.74	S		No bacteria count made. Below standard in total solids
3583	FS 406	5-10-44	Trow, N. D.	1.0323	4.6	9.02	13.62	U	45,000	
3561	FS 381	5-9-44	Votoe, Fred	1.0323	3.9	8.87	12.77	S	23,000	
7763	H 14	1-24-45	Votoe, Fred	1.0319	3.5	8.69	12.19	S	9,000	
3173	H 264	3-31-45	Votoe, Fred	1.0303	3.6	8.31	11.91	C	71,000	
3582	FS 402	5-9-44	Wilson, L. A.	1.0330	4.0	9.06	13.06	C	39,000	
7181	FS 119	8-30-44	Wilson, L. A.	1.0330	4.0	9.06	13.06	C	100,000	
7772	H 23	1-24-45	Wilson, L. A.	1.0324	4.6	9.04	13.64	S	86,000	
7823	H 38	1-26-45	Wilson, L. A.	1.0325	4.3	9.21	13.51	S	47,000	
3170	H 261	3-31-45	Wilson, L. A.	1.0329	3.9	9.02	12.92	C	27,000	
3568	FS 388	5-9-44	Wyman, Earl C.	1.0321	4.0	8.84	12.84	C	17,000	
7172	FS 110	8-30-44	Wyman, Earl C.	1.0309	4.1	8.55	12.65	S	500,000	
7778	H 29	1-24-45	Wyman, Earl C.	1.0330	4.6	9.19	13.79	S	532,000	
7938	H 121	2-12-45	Wyman, Earl C.	1.0322	4.2	8.90	13.10	S		No bacteria count made
3165	H 256	3-31-45	Wyman, Earl C.	1.0318	3.9	8.74	12.64	C	11,000	
BANGOR and BREWER										
7260	R 57	9-13-44	Crook & Son, M. A.	1.0319	4.6	8.90	13.50	S	115,000	
3246	R 325	4-17-45	Crook & Son, M. A.	1.0316	4.9	8.89	13.79	U	37,000	
3769	R 287	6-28-44	Davis, T. & J. J.	1.0320	3.5	8.71	12.21	C	9,000	
7507	R 117	10-31-44	Davis, T. & J. J.	1.0325	3.5	8.84	12.34	C	10,000	
3047	R 265	3-1-45	Davis, T. & J. J.	1.0323	3.7	8.83	12.53	S	10,000	
3223	R 312	4-11-45	Dorr, Albion M.	1.0328	3.4	8.89	12.29	U	7,000	
7898	R 219	2-7-45	Dougherty Bros.	1.0314	3.8	8.62	12.42	S	56,000	
3777	R 295	6-28-44	Ellis, Frank H.	1.0305	4.7	8.58	13.28	C	1,333,000	
3039	R 257	3-1-45	Ellis, Frank H.	1.0325	4.5	9.05	13.55	C		No bacteria count made
7105	R 51	8-15-44	Footman's Dairy	1.0312	4.0	8.61	12.61	C	18,000	
3222	R 311	4-11-45	Gray, Harold R.	1.0328	3.7	8.95	12.65	C	82,000	
7900	R 221	2-7-45	Grindel, F. S.	1.0327	5.0	9.20	14.20	C	894,000	
7265	R 62	9-13-44	Higgins Dairy	1.0315	3.9	8.67	12.57	C	635,000	
7899	R 220	2-7-45	King, Allie	1.0308	3.9	8.49	12.39	U	85,000	
3771	R 289	6-28-44	Mower, George R.	1.0311	3.9	8.57	12.47	C	2,349,000	
3058	R 276	3-1-45	Mower, George R.	1.0340	4.9	9.50	14.40	S	4,191,000	
3040	R 258	3-1-45	Palmer, Lloyd C.	1.0335	5.0	9.40	14.40	S		No bacteria count made
7264	R 61	9-13-44	Pickard, Floyd R.	1.0320	5.5	9.12	14.62	C	247,000	
7498	R 108	10-31-44	Pickard, Floyd R.	1.0325	4.7	9.09	13.79	C	86,000	
3057	R 275	3-1-45	Pickard, Floyd R.	1.0324	3.8	8.87	12.67	S	54,000	
3038	R 256	3-1-45	Price, Sam	1.0315	4.7	8.83	13.53	S		No bacteria count made
7261	R 58	9-13-44	Putnam, H. T.	1.0309	4.5	8.63	13.13	C	500,000	
7895	R 216	2-7-45	Putnam, H. T.	1.0335	4.6	9.32	13.92	C	122,000	
3043	R 261	3-1-45	Rudnicki, A.	1.0323	4.1	8.91	13.01			No sediment test made. No bacteria count made
3224	R 313	4-11-45	Runnells, H. Percy	1.0325	3.8	8.90	12.70	S	57,000	
3762	R 280	6-28-44	Sloat, Newman	1.0313	4.0	8.64	12.64	S	337,000	
3763	R 281	6-28-44	Sloat, Newman	1.0317	4.3	8.80	13.10	S	268,000	
7263	R 60	9-13-44	Sloat, Newman	1.0320	3.1	8.63	11.73	C	390,000	Below standard in fat and total solids

Table showing the results of the analyses of samples of raw milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
Bangor and Brewer—Cont.										
17896 R 217		2-7-45	Sloat, Newman	1.0326	3.9	8.94	12.84	U	1,108,000	
18241 R 320		4-17-45	Sloat, Newman	1.0323	3.9	8.87	12.77	U	159,000	
16775 R 293		6-28-44	Smith, Clifford B.	1.0316	4.7	8.85	13.55	U	150,000	
17256 R 53		9-13-44	Smith, Clifford B.	1.0320	4.7	8.95	13.66	U	152,000	
17625 R 159		12-20-44	Smith, Clifford B.	1.0317	4.5	8.84	13.34	U	47,000	
18032 R 250		3-1-45	Smith, Clifford B.	1.0320	4.7	8.96	13.66	S		No bacteria count m
18033 R 251		3-1-45	Smith, Clifford B.	1.0318	4.0	8.76	12.76	S		No bacteria count m
18034 R 252		3-1-45	Smith, Clifford B.	1.0340	5.0	9.52	14.52	S		No bacteria count m
18035 R 253		3-1-45	Smith, Clifford B.	1.0314	4.0	8.66	12.66	U		No bacteria count m
18036 R 254		3-1-45	Smith, Clifford B.	1.0310	4.8	8.72	13.52	U		No bacteria count m
18037 R 255		3-1-45	Smith, Clifford B.	1.0325	5.0	9.15	14.15	U		No bacteria count m
18240 R 319		4-17-45	Thibodeau, Guy J.	1.0332	4.0	9.11	13.11	S	204,000	
17259 R 56		9-13-44	Webber, Philip	1.0329	5.0	9.24	14.24	U	820,000	
BAR HARBOR										
16558 R 269		5-5-44	Hatch, A. J.	1.0321	3.9	8.82	12.72	U	44,000	
17080 S 78		8-10-44	Hatch, A. J.	1.0293	4.7	8.28	12.98	S	769,000	
17799 R 200		1-25-45	Hatch, A. J.	1.0329	4.0	9.04	13.04	U	104,000	
16555 R 266		5-5-44	Kelley, Hugh N.	1.0323	4.1	8.91	13.01	C	107,000	
17078 S 76		8-10-44	Kelley, Hugh N.	1.0323	4.5	9.00	13.50	C	12,000	
17801 R 202		1-25-45	Kelley, Hugh N.	1.0335	4.7	9.34	14.04	S	7,000	
16556 R 267		5-5-44	Russell, Paul L.	1.0332	4.7	9.26	13.93	S	49,000	
17076 S 74		8-10-44	Russell, Paul L.	1.0315	4.8	8.85	13.65	C	3,000†	
17798 R 199		1-25-45	Russell, Paul L.	1.0327	5.7	9.35	15.05	C	4,000	
16559 R 270		5-5-44	Sargent, Walter W., Jr.	1.0330	4.2	9.11	13.31	C	8,000	
17075 S 73		8-10-44	Sargent, Walter W., Jr.	1.0315	4.6	8.81	13.41	S	34,000	
17793 R 197		1-25-45	Sargent, Walter W., Jr.	1.0327	5.5	9.30	14.80	C	17,000	
16627 S 288		5-25-44	Sweet, Shirley	1.0320	4.9	9.00	13.90	C	3,000†	
17079 S 77		8-10-44	Sweet, Shirley	1.0314	4.2	8.70	12.90	S	93,000	
17795 R 196		1-25-45	Sweet, Shirley	1.0327	4.5	9.10	13.60	S	13,000	
16552 R 263		5-5-44	Whitney, Capt. H. C.	1.0323	4.7	9.04	13.74	S	92,000	
16628 S 289		5-25-44	Whitney, Capt. H. C.	1.0317	4.4	8.82	13.22	C	16,000	
17083 S 81		8-10-44	Whitney, Capt. H. C.	1.0326	4.0	8.96	12.96	S	161,000	
17797 R 198		1-25-45	Whitney, Capt. H. C.	1.0327	4.2	9.08	13.23	S	14,000	
BARING										
17301 S 148		10-3-44	Scribner, Leon	1.0315	5.7	9.04	14.74	C	3,000†	
16986 S 58		7-28-44	Sinclair, Mrs. D. B.	1.0303	4.5	8.49	12.99	U	56,000	
16981 S 53		7-28-44	Varnum, Earl	1.0301	3.8	8.47	12.27	S	42,000	
BATH										
16687 FS 444		6-14-44	Booker, A. W.	1.0327	4.5	9.10	13.60	S	42,000	
17923 H 106		2-10-45	Davis, Sadie K.	1.0344	5.0	9.62	14.62	U	12,000	
18106 H 197		3-16-45	Davis, Sadie K.	1.0346	5.0	9.67	14.67	U	52,000	
16686 FS 443		6-14-44	Davis, Sadie K.	1.0327	5.7	9.35	15.05	S	196,000	
16682 FS 439		6-14-44	Freeman, H. E.	1.0336	3.7	9.15	12.85	S	8,000	
16728 FS 473		6-15-44	Henderson, D. S.	1.0320	3.2	8.65	11.85	C	670,000	Below standard in
17932 H 115		2-10-45	Henderson, D. S.	1.0319	3.4	8.67	12.07	S	129,000	
18107 H 198		3-16-45	Henderson, D. S.	1.0318	3.6	8.68	12.28	S	292,000	
16684 FS 441		6-14-44	Hennessey, W. J.	1.0327	4.5	9.10	13.60	S	11,000	

† Less than.

Table showing the results of the analyses of samples of raw milk

Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
Bath—Cont.									
381 FS 438	6-14-44	Higgins, A. B.	1.0309	4.0	8.53	12.53	U	190,000	
393 FS 450	6-14-44	McIntosh, Duncan	1.0318	4.5	8.86	13.36	C	6,000	
928 H 111	2-10-45	McIntosh, Duncan	1.0307	4.0	8.49	12.49	U	81,000	
925 H 108	2-10-45	Larrabee, G. W.	1.0344	5.2	9.66	14.86	S	118,000	
924 H 107	2-10-45	Oakhurst Dairy Co.	1.0332	4.0	9.11	13.11	S	57,000	
931 H 114	2-10-45	Rooke, George W.	1.0338	5.7	9.52	15.22	U	77,000	
388 FS 445	6-14-44	Rosedale Farm	1.0327	4.7	9.14	13.84	S	62,000	
380 FS 437	6-14-44	Simpson, H. L.	1.0327	4.3	2.06	13.36	S	116,000	
326 H 109	2-10-45	Simpson, H. L.	1.0335	5.3	9.46	14.76	U	9,000	
389 FS 446	6-14-44	Stover, C. E.	1.0318	3.9	8.74	12.64	U	207,000	
927 H 110	2-10-45	Stover, C. E.	1.0334	5.4	9.46	14.96	U	442,000	
105 H 196	3-16-45	Stover, C. E.	1.0325	4.8	9.11	13.91	U	660,000	
392 FS 449	6-14-44	Sturmer, Frances	1.0327	4.3	9.06	13.36	C	89,000	
394 FS 451	6-14-44	Trott, Alfred E.	1.0336	5.1	9.44	14.54	C	41,000	
385 FS 442	6-14-44	Wing, E. E.	1.0318	4.7	8.90	13.60	C	39,000	
330 H 113	2-10-45	Wing, E. E.	1.0316	3.8	8.67	12.47	U	223,000	
108 H 199	3-16-45	Wing, E. E.	1.0319	3.6	8.71	12.31	U	70,000	
383 FS 440	6-14-44	Wing, H. B.	1.0318	4.2	8.80	13.00	U	360,000	
929 H 112	2-10-45	Wing, H. B.	1.0312	3.8	8.57	12.37	S	160,000	
109 H 200	3-16-45	Wing, H. B.	1.0315	3.6	8.61	12.21	U	128,000	
BELFAST									
222 S 94	9-7-44	Bartlett, Ivan	1.0318	5.8	9.14	14.94	C	138,000	
253 S 286	4-20-45	Bartlett, Ivan	1.0310	5.5	8.87	14.37	S	7,000	
303 S 302	6-13-44	Bryant, Elmer	1.0331	4.3	9.16	13.46	U	212,000	
223 S 95	9-7-44	Bryant, Elmer	1.0319	3.6	8.70	12.30	C	36,000	
758 S 309	1-23-45	Bryant, Elmer	1.0314	4.2	8.70	12.90	S	26,000	
255 S 388	4-20-45	Bryant, Elmer	1.0325	4.1	8.90	13.06	S	95,000	
345 FS 1	7-12-44	Hammond, Mrs. Helen T.	1.0320	3.9	8.79	12.69	C	3,000†	
359 S 298	6-13-44	Holmes, H. Fair	1.0320	3.5	8.71	12.21	C	90,000	
225 S 97	9-7-44	Holmes, H. Fair	1.0318	4.6	8.88	13.48	C	9,000	
759 S 310	1-23-45	Holmes, H. Fair	1.0325	5.3	9.21	14.51	S	5,000	
254 S 387	4-20-45	Holmes, H. Fair	1.0316	3.9	8.69	12.59	S	15,000	
BELGRADE									
352 FS 8	7-12-44	Bickford, Dennis	1.0300	3.4	8.19	11.59	S	8,000	Below standard in total solids
357 FS 13	7-12-44	Cottle, A. L.	1.0312	4.4	8.69	13.09	C	50,000	
348 FS 4	7-12-44	Dyke, M. E.	1.0327	4.2	9.03	13.23	S	542,000	
347 FS 3	7-12-44	Furbush, Maynard	1.0319	4.2	8.82	13.02	U	122,000	
346 FS 2	7-12-44	Sabons, Lester	1.0329	5.0	9.24	14.24	U	4,000	
356 FS 12	7-12-44	Scribner, H. W.	1.0330	4.3	9.13	13.43	S	76,000	
351 FS 7	7-12-44	Stevens, Elias	1.0330	4.9	9.25	14.15	U	96,000	
349 FS 5	7-12-44	Stevens, O. T.	1.0327	4.4	9.08	13.48	S	226,000	
358 FS 14	7-12-44	Wadleigh, John	1.0323	5.2	9.14	14.34	C	60,000	
BETHEL									
300 FS 510	6-29-44	Bennett, E. E.	1.0317	4.9	8.92	13.82	C	795,000	
797 FS 507	6-29-44	Blake, Roy	1.0315	4.3	8.75	13.05	C	46,000	
799 FS 509	6-29-44	Buck, E. S.	1.0332	4.8	9.28	14.08	C	43,000	
798 FS 508	6-29-44	Luxton, Ernest	1.0315	4.2	8.73	12.93	S	2,198,000	

Less than.

Table showing the results of the analyses of samples of raw milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
BIDDEFORD and SACO										
16936	AJ 40	7-21-44	Angers, George	1.0303	3.9	8.37	12.27	U	600,000	
16921	AJ 25	7-20-44	Anton, L.	1.0324	4.3	8.03	13.28	S	80,000	
17410	AJ 145	10-25-44	Anton, L.	1.0325	4.2	9.88	14.08	G	29,000	
17093	AJ 93	8-10-44	Biddeford Dairy	1.0300	3.6	8.23	11.83	C	1,397,000	
16930	AJ 34	7-20-44	Boucher & Son, N.	1.0320	3.7	8.75	12.45	C	44,000	
17488	AJ 183	10-28-44	Boucher & Son, N.	1.0308	4.4	8.50	12.99	U	50,000	
16927	AJ 31	7-20-44	Chretien, Alfred	1.0318	4.0	8.76	12.76	S	92,000	
17434	AJ 179	10-28-44	Chretien, Alfred	1.0312	3.8	8.57	12.37	S	107,000	
17446	AJ 162	10-26-44	Corneau, Theodore	1.0313	3.5	8.54	12.04	S	39,000	
16914	AJ 18	7-20-44	Crepeau & Son, A.	1.0323	4.0	8.89	12.89	U	520,000	
17477	AJ 172	10-27-44	Crepeau & Son, A.	1.0331	4.2	9.14	13.34	U	115,000	
16925	AJ 29	7-20-44	Curtis & Son, Harold C.	1.0320	4.0	8.81	12.81	U	37,000	
17486	AJ 181	10-28-44	Curtis & Son, Harold C.	1.0321	4.5	8.95	13.45	C	84,000	
16918	AJ 22	7-20-44	Dube, Joseph	1.0315	3.9	8.07	12.57	U	179,000	
16917	AJ 21	7-20-44	Dupuis, Eugene	1.0324	3.5	8.81	12.31	S	31,000	
17441	AJ 157	10-23-44	Dupuis, Eugene	1.0306	4.5	8.56	13.06	S	26,000	
16924	AJ 28	7-20-44	Emmons, Leroy	1.0318	3.6	8.68	12.28	S	156,000	
17486	AJ 180	10-28-44	Emmons, Leroy	1.0310	4.0	8.83	13.43	C	141,000	
16900	AJ 4	7-20-44	Fenderson, G. H.	1.0323	4.0	8.89	12.89	O	22,000	
17098	AJ 98	8-10-44	Fenderson, G. H.	1.0323	4.3	8.96	13.26	S	178,000	
17478	AJ 173	10-27-44	Fenderson, G. H.	1.0321	4.1	8.86	12.96	S	20,000	
17479	AJ 174	10-27-44	Fenderson, G. H.	1.0321	4.3	8.91	13.21	C	7,000	
16919	AJ 23	7-20-44	Fogg Bros.	1.0306	3.4	8.34	11.74	S	174,000	Below standard in total solids
17413	AJ 148	10-25-44	Fogg Bros.	1.0293	4.0	8.21	12.21	C	78,000	
16931	AJ 35	7-20-44	Gilpatrick, Charles	1.0311	4.0	8.59	12.59	U	400,000	
17432	AJ 177	10-28-44	Gilpatrick, Charles	1.0313	4.2	8.68	12.88	C	430,000	
16898	AJ 2	7-20-44	Gonville, Lucien	1.0308	3.9	8.49	12.39	C	23,000	10-ounce container
17442	AJ 158	10-26-44	Gonville, Lucien	1.0313	3.6	8.56	12.16	U	149,000	
16932	AJ 36	7-20-44	Guay, Arthur	1.0303	3.6	8.31	11.91	U	2,222,000	
17445	AJ 161	10-26-44	Guay, Arthur	1.0323	4.6	9.02	13.62	U	3,746,000	
16923	AJ 27	7-20-44	Haley & Son, J. W.	1.0318	3.5	8.66	12.16	U	104,000	
17476	AJ 171	10-27-44	Haley & Son, J. W.	1.0315	4.6	8.81	13.41	S	15,000	
16908	AJ 12	7-20-44	Harris, L. W.	1.0335	4.8	9.36	14.16	U	11,000	
17473	AJ 168	10-27-44	Harris, L. W.	1.0323	4.2	8.93	13.13	C	213,000	
16950	AJ 54	7-21-44	Houston, Chester	1.0325	4.0	8.94	12.94	O	140,000	
16911	AJ 15	7-20-44	Landry, Arthur	1.0305	3.9	8.42	12.32	S	320,000	
16913	AJ 17	7-20-44	Landry, Arthur	1.0317	3.9	8.72	12.62	S	840,000	Sediment test on one-half pint
17412	AJ 147	10-25-44	Landry, Arthur	1.0311	4.7	8.73	13.43	S	378,000	
16943	AJ 243	5-27-44	Landry, William L.	1.0303	4.3	8.45	12.75	S	11,000	
16922	AJ 25	7-20-44	L'Heureux, Alfred	1.0336	4.8	9.38	14.18	U	73,000	
17474	AJ 109	10-27-44	L'Heureux, Alfred	1.0321	5.1	9.07	14.17	C	23,000	
16926	AJ 30	7-20-44	Littlefield, George	1.0318	3.9	8.74	12.64	S	440,000	
17487	AJ 182	10-28-44	Littlefield, George	1.0318	4.5	8.86	13.36	U	63,000	
16909	AJ 13	7-20-44	Melanson, D. P.	1.0315	4.2	8.63	12.83	S	472,000	
16906	AJ 9	7-20-44	Meserve, Ralph	1.0323	3.8	8.85	12.65	C	552,000	
17416	AJ 151	10-25-44	Meserve, Ralph	1.0318	4.0	8.76	12.76	O	25,000	
17481	AJ 176	10-28-44	Meserve, Ralph	1.0315	4.0	8.69	12.69	O	45,000	
16929	AJ 33	7-20-44	Nadeau, Peter	1.0320	4.2	8.85	13.05	C	720,000	
17471	AJ 166	10-27-44	Nadeau, Peter	1.0318	3.9	8.74	12.64	U	65,000	
17415	AJ 150	10-25-44	Olson, Olaf	1.0317	4.0	8.74	12.74	C	17,000	
16928	AJ 32	7-20-44	Paquette, Theodore	1.0330	4.1	9.08	13.18	C	68,000	
17483	AJ 178	10-28-44	Perrault, Thomas	1.0313	4.1	8.66	12.76	C	17,000	
17409	AJ 144	10-25-44	Pike, John F.	1.0329	5.5	9.35	14.85	U	85,000	
16916	AJ 20	7-20-44	Pothier, Arsene	1.0325	3.3	8.80	12.10	S	18,000	
16933	AJ 37	7-20-44	Pothier & Son, John	1.0330	3.8	9.02	12.82	S	39,000	

Table showing the results of the analyses of samples of raw milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
Biddeford and Saco—Cont.										
17443	AJ 159	10-26-44	Pothier & Son, John	1.0322	4.9	9.05	13.95	S	19,000	
17437	AJ 153	10-26-44	Saco Retreat	1.0312	3.9	8.59	12.49	O	23,000	
16935	AJ 39	7-20-44	Saco Retreat	1.0330	4.2	9.11	13.31	U	320,000	
16920	AJ 24	7-20-44	Samson, Alfred	1.0297	3.8	8.20	12.00	S	60,000	
17440	AJ 156	10-26-44	Samson, Alfred	1.0323	4.2	8.93	13.13	S	20,000	
17472	AJ 167	10-27-44	Samson, Alfred	1.0318	4.1	8.78	12.88	U	180,000	
16934	AJ 38	7-20-44	Sawyer, Elmer F.	1.0332	5.1	9.34	14.44	S	128,000	
16906	AJ 10	7-20-44	Scammon, J. Wesley	1.0333	3.5	9.04	12.54	S	96,000	
17406	AJ 141	10-25-44	Scammon, J. Wesley	1.0319	4.5	8.89	13.39	C	130,000	
16903	AJ 7	7-20-44	Scammon, Roy L.	1.0323	3.3	8.75	12.05	S	93,000	
17436	AJ 152	10-26-44	Scammon, Roy L.	1.0317	4.1	8.76	12.86	S	113,000	
16915	AJ 19	7-20-44	Tardiff, A.	1.0305	4.2	8.48	12.68	S	16,000	
17407	AJ 142	10-25-44	Tardiff, A.	1.0323	4.1	8.91	13.01	C	37,000	
16901	AJ 5	7-20-44	Turcotte, L.	1.0323	3.3	8.75	12.05	C	151,000	
17438	AJ 154	10-26-44	Turcotte, L.	1.0325	3.7	8.88	12.58	S	20,000	
17037	AJ 88	8-4-44	Willey, P. R.	1.0309	3.3	8.37	11.07	U	172,000	Below standard in total solids
17489	AJ 184	10-28-44	Willey, P. R.	1.0337	4.9	9.43	14.33	C	7,000	
BINGHAM										
1765*	S 266	12-21-44	Chasse, Philip R.	1.0326	4.1	8.98	13.08	S	254,000	
1765*	S 265	12-21-44	Dunlap, A. S.	1.0305	3.8	8.40	12.20	U	364,000	
BLUEHILL										
16625	S 287	5-24-44	Austin, Mrs. William	1.0317	4.8	8.90	13.70	C	4,000	
17612	S 247	11-30-44	Austin, Mrs. William	1.0329	5.2	9.23	14.48	S	3,000†	
16624	S 286	5-24-44	Horton, Mrs. W. S.	1.0325	4.6	9.07	13.67	C	31,000	
17064	S 62	8-9-44	Horton, Mrs. W. S.	1.0300	4.5	8.41	12.91	U	86,000	
17611	S 246	11-30-44	Horton, Mrs. W. S.	1.0330	4.8	9.23	14.03	U	1,270,000	
BOWDOINHAM										
16732	FS 477	6-15-44	Billings, S. N.	1.0320	5.0	9.02	14.02	C	132,000	
18116	H 207	3-28-45	Elliott, Edmund	1.0297	7.5	9.07	16.57	U	24,000	
18104	H 195	3-15-45	Hanson, Ray G.	1.0340	5.8	9.69	15.49	U	60,000	
18120	H 211	3-28-45	Hanson, Ray G.	1.0334	6.2	9.73	15.93	U	98,000	
16731	FS 476	6-15-44	Purington, W. F.	1.0342	5.4	9.66	15.06	S	201,000	
BROWNVILLE and BROWNVILLE JCT.										
16866	S 26	7-12-44	Davis, Joseph W.	1.0313	4.8	8.80	13.60	C	266,000	
17429	S 216	10-25-44	Davis, Joseph W.	1.0320	4.8	8.93	13.78	S	132,000	
18086	S 380	3-7-45	Davis, Joseph W.	1.0345	4.6	9.57	14.17	C	224,000	
16864	S 24	7-12-44	Searles, Joseph	1.0325	4.9	9.13	14.03	C	55,000	
17428	S 215	10-25-44	Searles, Joseph	1.0334	5.0	9.37	14.37	S	12,000	
18087	S 381	3-7-45	Searles, Joseph	1.0325	4.2	8.98	13.18	C	8,000	
16805	S 25	7-12-44	Stineford & Son, W. H.	1.0313	4.8	8.80	13.60	C	304,000	

† Less than.

Table showing the results of the analyses of samples of raw milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
BRUNSWICK										
16715	FS 400	6-15-44	Blette, F. J.	1.0344	4.2	9.46	13.66	S	334,000	
179:8	H 101	2-9-45	Elliott, Edward	1.0318	4.9	8.94	13.84	U	1,397,000	
18023	H 177	2-23-45	Elliott, Edward	1.0323	4.7	9.04	13.74	U	406,000	
16713	FS 458	6-15-44	Emerson, E. L.	1.0344	5.0	9.62	14.62	O	247,000	
18102	H 193	3-15-45	Harmon, F. E.	1.0329	4.5	9.15	13.65	S	19,000	
16721	FS 436	6-15-44	Harmon, W. E.	1.0327	4.3	9.06	13.36	U	400,000	
17915	H 98	2-9-45	Harmon, W. E.	1.0320	4.4	8.90	13.30	U	19,000	
16726	FS 471	6-15-44	Merriman, A.	1.0339	4.9	9.47	14.37	S	11,000	
16714	FS 459	6-15-44	Smith, F. E.	1.0344	5.2	9.66	14.86	U	102,000	
17914	H 97	2-9-45	Smith, F. E.	1.0340	5.3	9.58	14.88	S	406,000	
18025	H 179	2-23-45	Smith, F. E.	1.0330	5.0	9.27	14.27	S	13,000	
17919	H 102	2-9-45	Todd, Frank	1.0323	5.1	9.12	14.22	C	74,000	
BUCKSPORT										
17431	R 87	10-25-44	Colby, Clifford	1.0323	5.2	9.14	14.34	S	568,000	
17730	R 186	1-12-45	Colby, Clifford	1.0325	4.1	8.96	13.06	U	580,000	
17434	R 93	10-25-44	Gross, Irving D.	1.0305	6.2	9.00	15.20	U	146,000	
17728	R 184	1-12-45	Gross, Irving D.	1.0315	6.0	9.11	15.11	U	18,000	
17432	R 88	10-25-44	Smith, A. E.	1.0305	4.9	8.62	13.52	U	124,000	
17727	R 183	1-12-45	Smith, A. E.	1.0325	5.0	9.15	14.15	U	17,000	
17732	R 188	1-12-45	Stubbs, Harry	1.0342	3.5	9.27	12.77	S*	1,461,000	Sediment test on one-half pint
17433	R 89	10-25-44	Wight, Edward	1.0305	5.4	8.73	14.13	S	15,000	
17731	R 187	1-12-45	Wight, Edward	1.0333	4.5	9.25	13.75	C	251,000	
CALAIS										
16976	S 48	7-28-44	Eaton Dairy Farm	1.0291	3.9	8.07	11.97	U	42,000	
17311	S 158	10-3-44	Eaton Dairy Farm	1.0300	4.5	8.41	12.91	S	22,000	
16977	S 49	7-28-44	Gardner, Mrs. A. P.	1.0318	4.9	8.34	13.24	U	81,000	
17306	S 153	10-3-44	Gardner, Mrs. A. P.	1.0315	5.5	9.00	14.50	S	10,000	
16979	S 51	7-28-44	Higgins, Foster B.	1.0313	3.7	8.58	12.28	U	172,000	
17305	S 152	10-3-44	Higgins, Foster B.	1.0336	4.6	9.34	13.94	S	74,000	
16987	S 59	7-28-44	Knight, K. J.	1.0313	4.5	8.74	13.24	U	74,000	
17310	S 157	10-3-44	Knight, K. J.	1.0314	4.3	8.72	13.02	C	21,000	
17309	S 156	10-3-44	Knight, William	1.0314	4.5	8.76	13.26	U	296,000	
16988	S 60	7-28-44	Lyons, M. K.	1.0315	3.6	8.61	12.21	U	120,000	
17308	S 155	10-3-44	Lyons, M. K.	1.0320	4.2	8.85	13.05	S	280,000	
16978	S 50	7-28-44	Young, Mrs. Arthur	1.0318	4.0	8.76	12.76	U	130,000	
17307	S 154	10-3-44	Young, Mrs. Arthur	1.0320	4.7	8.96	13.66	S	49,000	
CAMDEN										
16741	S 337	6-16-44	Marriner, Maynard	1.0320	4.8	8.98	13.78	C	4,000	
18202	S 395	4-25-45	Marriner, Maynard	1.0334	5.6	9.50	15.10	C	8,000	
18203	S 396	4-25-45	Marriner, Maynard	1.0315	4.9	8.87	13.77	C	7,000	
16740	S 333	6-16-44	Nichols, B. H.	1.0340	4.2	9.36	13.56	S	27,000	
17994	S 343	2-22-45	Nichols, B. H.	1.0324	4.1	8.93	13.03	C	25,000	
17338	S 334	6-16-44	Simonton, Ray	1.0323	4.2	8.93	13.13	S	33,000	
CANTON										
16819	FS 529	6-30-44	Ellis, S. B.	1.0317	3.6	8.66	12.26	C	6,000	

Table showing the results of the analyses of samples of raw milk

Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
CARIBOU									
R 296	4-5-45	Belyea, Don	1.0320	4.6	8.94	13.54	C	95,000	
R 244	2-23-45	Beveridge, R. W.	1.0323	3.5	8.79	12.29	U	240,000	
R 289	4-5-45	Beveridge, R. W.	1.0327	4.0	8.99	12.99	S	123,000	
R 295	4-5-45	Gould, J. S.	1.0345	5.4	9.74	15.14	U	23,000	
R 7	7-20-44	Greenier, Edward R.	1.0311	6.1	9.16	15.26	S	806,000	
R 293	4-5-45	Greenier, Edward R.	1.0312	5.0	8.81	13.81	C	27,000	
R 294	4-5-45	Mitchell, Perry A.	1.0335	4.6	9.32	13.92	C	11,000	
R 5	7-20-44	Noble, H. W.	1.0320	3.1	8.63	11.73	S	290,000	Below standard in fat and total solids
R 241	2-23-45	Noble, H. W.	1.0323	5.1	9.12	14.22	U	1,000,000†	
R 292	4-5-45	Noble, H. W.	1.0331	5.1	9.32	14.42	U	181,000	
R 6	7-20-44	Randolph, Carl E.	1.0311	3.4	8.47	11.87	C	4,000	
R 242	2-23-45	Randolph, Carl E.	1.0340	4.2	9.36	13.56	C	4,000	
R 291	4-5-45	Randolph, Carl E.	1.0321	4.7	8.99	13.69	U	3,000†	
R 288	4-5-45	Shaw, Mrs. Harry	1.0338	4.2	9.31	13.51	U	13,000	
R 4	7-20-44	Thomas, Allan M.	1.0330	3.6	8.98	12.58	C	11,000	
R 290	4-5-45	Thomas, Allan M.	1.0331	4.3	9.16	13.46	U	18,000	
CARMEL									
R 310	4-11-45	Parsons, Julian A.	1.0323	5.9	9.29	15.19	U	69,000	
CLINTON									
S 382	3-15-45	Gibson, Holman	1.0327	3.7	8.93	12.63	U	116,000	
S 383	3-15-45	Gibson, Holman	1.0334	3.8	9.12	12.92	U	43,000	
CORINNA									
R 81	9-17-44	Chase, Roland	1.0330	5.0	9.27	14.27	U	34,000	
R 82	9-17-44	Chase, Roland	1.0316	4.0	8.71	12.71	U	9,000	
R 85	10-24-44	Chase, Roland	1.0326	3.9	8.94	12.84	U	80,000	
S 9	7-10-44	Hopkins & Son, G. E.	1.0317	4.0	8.74	12.74	C	158,000	
R 83	9-17-44	Hopkins & Son, G. E.	1.0328	5.1	9.24	14.34	S	11,000	
S 187	10-23-44	Hopkins & Son, G. E.	1.0331	5.0	9.30	14.30	C	7,000	
S 362	3-5-45	Hopkins & Son, G. E.	1.0314	4.5	8.76	13.26	C	14,000	
DEER ISLE									
S 245	11-30-44	Billings, Garfield	1.0325	5.4	9.23	14.63	C	132,000	
DEXTER									
S 6	7-10-44	Roberts, O. J.	1.0324	4.1	8.93	13.03	S	372,000	
S 191	10-23-44	Roberts, O. J.	1.0327	4.7	9.09	13.79	S	4,000	
S 372	3-7-45	Roberts, O. J.	1.0330	4.4	9.15	13.55	C	8,000	
S 373	3-7-45	Roberts, O. J.	1.0325	4.2	8.98	13.18	C	670,000	
S 374	3-7-45	Roberts, O. J.	1.0330	5.9	9.46	15.36	C	6,000	
S 5	7-10-44	Robinson, A. C.	1.0324	4.3	8.98	13.28	S	4,572,000	
S 190	10-23-44	Robinson, A. C.	1.0327	4.1	9.01	13.11	C	95,000	
S 371	3-7-45	Robinson, A. C.	1.0327	4.3	9.06	13.36	S	540,000	
S 8	7-10-44	Sawyer, B. E.	1.0326	4.0	8.96	12.96	S	388,000	

less than.
greater than.

Table showing the results of the analyses of samples of raw milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
Dexter—Cont.										
17388	S 188	10-23-44	Sawyer, B. E.	1.0330	4.6	9.19	13.79	C	4,000	
18075	S 369	3- 7-45	Sawyer, B. E.	1.0320	4.7	8.96	13.66	U	960,000	
18833	S 7	7-10-44	Tibbetts, Fred L.	1.0315	4.7	8.83	13.53	U	240,000	
17389	S 189	10-23-44	Tibbetts, Fred L.	1.0325	4.6	9.07	13.67	S	59,000	
18076	S 370	3- 7-45	Tibbetts, Fred L.	1.0338	4.8	9.43	14.23	S	1,280,000	
DIXFIELD										
16815	FS 525	6-30-44	Rose, Nelson	1.0317	5.5	9.05	14.55	S	232,000	
16816	FS 526	6-30-44	Smith, Leon C.	1.0317	4.8	8.80	13.10	S	125,000	
DOVER-FOXCROFT										
16842	S 16	7-11-44	Blanchard's Dairy	1.0320	4.1	8.8	12.93	S	222,000	
17425	S 212	10-25-44	Blanchard's Dairy	1.0315	4.5	8.75	13.29	U	51,000	
18074	S 368	3- 6-45	Blanchard's Dairy	1.0325	5.0	9.15	14.15	U	138,000	
16843	S 17	7-11-44	Dow, Elwin	1.0330	4.7	8.45	13.15	U	45,000	
16844	S 18	7-11-44	Dow, Elwin	1.0331	4.3	9.16	13.46	U	1,270,000	
17423	S 210	10-25-44	Dow, Elwin	1.0331	5.7	9.45	15.15	S	13,000	
17424	S 211	10-25-44	Dow, Elwin	1.0317	4.8	8.96	13.70	C	196,000	
18073	S 367	3- 6-45	Dow, Elwin	1.0340	4.7	9.46	14.16	C	19,000	
16841	S 15	7-11-44	Meisner & Son, J. W.	1.0327	5.5	9.30	14.80	C	28,000	
17422	S 209	10-25-44	Meisner & Son, J. W.	1.0331	5.0	9.30	14.30	S	29,000	
18072	S 366	3- 6-45	Meisner & Son, J. W.	1.0328	5.3	9.28	14.58	C	190,000	
EASTPORT										
16974	S 46	7-27-44	Bayliss, A. J.	1.0298	3.3	8.12	11.42	S	360,000	Below standard in total solids
17316	S 163	10- 3-44	Bayliss, A. J.	1.0310	3.7	8.50	12.20	O	48,000	
16969	S 41	7-27-44	Dore, Horace	1.0325	4.5	9.05	13.55	U	1,270,000	
16973	S 45	7-27-44	Dore, J. E.	1.0327	4.4	9.08	13.48	U	5,000	
17319	S 166	10- 3-44	Dore, J. E.	1.0323	5.2	9.14	14.34	C	6,000	
16970	S 42	7-27-44	Flagg, Roy H.	1.0313	3.4	8.52	11.92	U	117,000	
17314	S 161	10- 3-44	Flagg, Roy H.	1.0313	4.7	8.78	13.48	C	640,000	
17318	S 165	10- 3-44	Frost, Austin	1.0312	4.5	8.71	13.21	C	86,000	
17317	S 164	10- 3-44	Johnson, Charles	1.0312	4.7	8.75	13.45	O	66,000	
16971	S 43	7-27-44	Kinney, Leroy	1.0325	4.5	9.05	13.55	S	15,000	
17312	S 159	10- 3-44	Kinney, Leroy	1.0315	5.8	9.07	14.87	S	11,000	
16967	S 39	7-27-44	Knowlton, E. J.	1.0317	3.9	8.72	12.62	U	115,000	
16968	S 40	7-27-44	Knowlton, E. J.	1.0325	4.3	9.01	13.31	U	147,000	
17315	S 162	10- 3-44	Knowlton, E. J.	1.0333	4.0	9.27	13.87	C	3,000	
16972	S 44	7-27-44	Pottle, Roy	1.0325	4.3	9.01	13.31	S	16,000	
17313	S 160	10- 3-44	Pottle, Roy	1.0325	4.8	9.11	13.91	S	23,000	
ELLSWORTH										
17008	S 66	8- 9-44	Estey, S. S.	1.0308	3.6	8.43	12.03	S	4,000	
17336	S 183	10- 4-44	Estey, S. S.	1.0326	4.1	8.98	13.08	U		No bacteria count
16622	S 284	5-24-44	Karst, George	1.0323	4.7	9.04	13.74	S	500,000	
17066	S 64	8- 9-44	Karst, George	1.0300	5.0	8.51	13.51	S	173,000	
17333	S 180	10- 4-44	Karst, George	1.0316	4.8	8.87	13.67	U	128,000	
16619	S 281	5-24-44	Moore, G. W.	1.0332	4.6	9.24	13.84	C	24,000	

Table showing the results of the analyses of samples of raw milk

Station Number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
Ellsworth—Cont.										
005 S 63		8-9-44	Moore, G. W.	1.0330	4.7	9.21	13.91	C	52,000	No bacteria count made
334 S 181		10-4-44	Moore, G. W.	1.0345	5.0	9.65	14.65	C		
ENFIELD										
534 R 132		11-8-44	Lancaster, Mrs. H. L.	1.0308	4.9	8.69	13.59	U	75,000	
FARMINGTON										
275 S 130		9-19-44	Corbett, Arthur	1.0310	4.5	8.66	13.16	C	762,000	
274 S 129		9-19-44	Gilbert & Son, Harvey W.	1.0349	4.1	9.56	13.66	S	12,000	
277 S 132		9-19-44	Hoar, G. D.	1.0340	5.3	9.53	14.83	C	70,000	
273 S 128		9-19-44	Titcomb, H. A.	1.0310	5.4	8.85	14.25	S	46,000	
FORT FAIRFIELD										
002 R 42		8-9-44	Murphy, Henry	1.0314	4.0	8.66	12.66	U	86,000	
FREEPORT										
007 H 188		3-15-45	Beggs, Joseph	1.0348	4.5	9.62	14.12	C	38,000	
005 H 186		3-15-45	Soule, C. H.	1.0336	5.3	9.48	14.78	S	156,000	
115 H 206		3-28-45	Soule, C. H.	1.0339	5.0	9.50	14.50	C	4,000	
094 H 185		3-15-45	Talbert, Arthur	1.0345	5.9	9.84	15.74	S	6,000	
GARDINER										
602 FS 422		5-12-44	Adams, O. H.	1.0323	4.1	8.91	13.01	C	28,000	No bacteria count made
210 FS 148		9-2-44	Adams, O. H.	1.0314	4.4	8.74	13.14	S	32,000	
810 H 55		1-26-45	Adams, O. H.	1.0316	4.0	8.71	12.71	S		
190 H 271		4-5-45	Adams, O. H.	1.0327	4.0	8.99	12.99	S	488,000	
601 FS 421		5-12-44	Austin, Rollie	1.0333	3.5	9.04	12.54	C	17,000	
212 FS 150		9-2-44	Austin, Rollie	1.0322	3.9	8.84	12.74	S	10,000	
841 H 56		1-26-45	Austin, Rollie	1.0323	4.3	8.96	13.26	S		No bacteria count made
951 H 134		2-14-45	Austin, Rollie	1.0323	3.8	8.85	12.65	U	166,000	
194 H 275		4-5-45	Austin, Rollie	1.0313	3.5	8.54	12.04	U	189,000	
603 FS 423		5-12-44	Coombs, H. G.	1.0315	3.4	8.57	11.97	C	264,000	
208 FS 146		9-2-44	Coombs, H. G.	1.0323	3.8	8.85	12.65	S	320,000	
838 H 53		1-26-45	Coombs, H. G.	1.0324	3.9	8.89	12.79	S		No bacteria count made
950 H 133		2-14-45	Coombs, H. G.	1.0323	3.8	8.85	12.65	C	402,000	
105 H 276		4-5-45	Coombs, H. G.	1.0318	3.4	8.64	12.04	S	63,000	
614 FS 434		5-12-44	Curtis, W. A.	1.0327	4.2	9.03	13.23	C	5,000	
187 H 268		4-5-45	Curtis, W. A.	1.0325	4.2	8.98	13.18	U	32,000	
848 H 63		1-26-45	Gardiner, R. H.	1.0318	4.1	8.78	12.88	S		No bacteria count made
871 H 77		2-3-45	Gardiner, R. H.	1.0331	5.4	9.39	14.79	S	7,000	
198 H 279		4-5-45	Gardiner, R. H.	1.0330	4.5	9.17	13.67	S	16,000	
600 FS 420		5-12-44	Gosline, A. N.	1.0323	3.8	8.85	12.65	S	228,000	
211 FS 149		9-2-44	Gosline, A. N.	1.0324	4.9	9.10	14.00	C	43,000	
842 H 57		1-26-45	Gosline, A. N.	1.0322	3.9	8.84	12.74	U		No bacteria count made
875 H 81		2-3-45	Gosline, A. N.	1.0324	3.9	8.89	12.79	S	66,000	
192 H 273		4-5-45	Gosline, A. N.	1.0336	4.0	9.21	13.21	S	25,000	

Table showing the results of the analyses of samples of raw milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
Gardiner—Cont.										
16612	FS 432	5-12-44	Grant & Son, H. P.	1.0336	4.5	9.17	13.67	C	3,000†	
17874	H 80	2-3-45	Hinkley, H. W.	1.0334	3.8	9.12	12.92	U	97,000	
16599	FS 419	5-12-44	Jones & Son, S.	1.0313	4.0	8.64	12.64	C	262,000	
17209	FS 147	9-2-44	Jones & Son, S.	1.0315	4.1	8.71	12.81	C	133,000	
17839	H 54	1-26-45	Jones & Son, S.	1.0330	3.8	9.02	12.82	O		No bacteria count ma
17954	H 137	2-14-45	Jones & Son, S.	1.0311	3.5	8.49	11.99	S	28,000	
18191	H 272	4-5-45	Jones & Son, S.	1.0327	3.8	8.95	12.75	S	108,000	
17898	H 74	2-3-45	Norton, J. E.	1.0310	4.5	8.60	13.16	S	20,000	
18188	H 269	4-5-45	Norton, J. E.	1.0309	4.3	8.60	12.90	S	8,000	
17869	H 76	2-3-45	Perkins, Perley	1.0350	6.3	10.15	16.45	U	305,000	
16613	FS 433	5-12-44	Perkins, Perley	1.0340	3.1	9.13	12.23	C	212,000	Below standard in fat
17953	H 136	2-14-45	Perkins, Perley	1.0332	4.8	9.23	14.03	S	51,000	
16607	FS 427	5-12-44	Pottle, Otis	1.0320	4.0	8.81	12.81	S	14,000	
17873	H 79	2-3-45	Sawyer, A. L.	1.0334	4.9	9.35	14.25	F	10,000	
18189	H 270	4-5-45	Sawyer, A. L.	1.0327	4.3	9.06	13.36	S	370,000	
16598	FS 418	5-12-44	Skehan, T. F.	1.0315	3.8	8.65	12.45	C	99,000	
17840	H 61	1-26-45	Skehan, T. F.	1.0315	3.4	8.57	11.97	S		No bacteria count ma
17952	H 135	2-14-45	Skehan, T. F.	1.0314	3.6	8.58	12.18	S	43,000	
18196	H 277	4-5-45	Skehan, T. F.	1.0318	3.5	8.66	12.16	C	4,000	
16610	FS 430	5-12-44	Troop, John	1.0323	3.9	8.87	12.77	C	38,000	
17207	FS 145	9-2-44	Troop, John	1.0319	4.0	9.03	13.03	C		No bacteria count ma
17843	H 58	1-26-45	Troop, John	1.0335	4.0	9.19	13.19	S		No bacteria count ma
GORHAM										
17414	AJ 149	10-25-44	Merrill, J. S.	1.0317	3.6	8.66	12.26	C	352,000	
GREENVILLE										
17393	S 193	10-24-44	Ames, K. Cecil	1.0318	5.7	9.11	14.81	U	45,000	
17397	S 197	10-24-44	Carter, G. A.	1.0320	5.7	9.17	14.87	S	96,000	
17395	S 195	10-24-44	Graham, Mrs. William	1.0320	5.6	9.15	14.75	U	102,000	
17394	S 194	10-24-44	Muzzy, S. L.	1.0301	3.7	8.28	11.98	S	281,000	
17398	S 198	10-24-44	Sawtelle, C. A.	1.0326	4.3	9.03	13.33	U	3,000†	
17396	S 196	10-24-44	Young, S. P. & John	1.0314	4.9	8.84	13.74	U	210,000	
GUILFORD										
16836	S 10	7-11-44	Campbell, R. M.	1.0310	4.5	8.66	13.16	C	62,000	
17400	S 200	10-24-44	Campbell, R. M.	1.0330	4.8	9.23	14.03	S	26,000	
18069	S 363	3-6-46	Campbell, R. M.	1.0325	4.8	9.11	13.91	U	303,000	
10838	S 12	7-11-44	McLaughlin, L. G.	1.0336	5.3	9.43	14.73	C	20,000	
10839	S 13	7-11-44	McLaughlin, L. G.	1.0327	5.1	9.22	14.32	C	508,000	
17401	S 201	10-24-44	McLaughlin, L. G.	1.0331	5.4	9.39	14.79	C	24,000	
17402	S 202	10-24-44	McLaughlin, L. G.	1.0330	5.1	9.29	14.39	S	191,000	
18070	S 364	3-6-45	McLaughlin, L. G.	1.0339	5.0	9.50	14.50	S	22,000	
18071	S 365	3-6-45	McPheters, E. W.	1.0331	4.6	9.22	13.82	C	52,000	
16837	S 11	7-11-44	Stevens, E. H.	1.0336	4.9	9.40	14.30	C	3,000†	
17417	S 204	10-25-44	Stevens, E. H.	1.0313	4.8	8.80	13.60	S	22,000	
HALLOWELL										
16616	FS 436	5-12-44	Clark, Lester	1.0333	4.3	9.21	13.51	S	90,000	

† Less than.

Table showing the results of the analyses of samples of raw milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count--Colonies per c.c.	Remarks
Hallowell--Cont.										
594 FS 414		5-12-44	Crimmin, H. E.	1.0310	3.8	8.52	12.32	S	131,000	No bacteria count made Below standard in fat and total solids
195 FS 133		9-1-44	Crimmin, H. E.	1.0311	3.8	8.55	12.35	S	107,000	
782 H 68		1-27-45	Crimmin, H. E.	1.0316	4.1	8.73	12.83	S	110,000	
941 H 124		2-12-45	Crimmin, H. E.	1.0313	3.8	8.60	12.40	U		
595 FS 415		5-12-44	Doucette, Henry	1.0313	3.0	8.44	11.44	S	332,000	
784 H 49		1-26-45	Doucette, Henry	1.0326	3.5	8.86	12.36	S	146,000	Sediment test on one-half pint
615 FS 435		5-12-44	Horne, E. M.	1.0317	4.5	8.84	13.34	C	47,000	
781 H 46		1-26-45	Horne, E. M.	1.0305	5.0	8.64	13.64	S	42,000	
592 FS 412		5-12-44	Lebel, A. J.	1.0326	3.4	8.84	12.24	S	26,000	
198 FS 136		9-1-44	Lebel, A. J.	1.0324	5.1	9.14	14.24	C	302,000	
783 H 48		1-26-45	Lebel, A. J.	1.0326	4.8	9.13	13.93	U	100,000	
949 H 132		2-14-45	Lebel, A. J.	1.0323	4.2	8.93	13.13	S	27,000	
596 FS 416		5-12-44	Lord, A. S.	1.0313	4.8	8.80	13.60	S	30,000	
196 FS 134		9-1-44	Lord, A. S.	1.0311	4.3	8.65	12.95	U	33,000	
780 H 66		1-27-45	Lord, A. S.	1.0335	6.2	9.76	15.96	U	960,000	
947 H 130		2-14-45	Lord, A. S.	1.0319	4.5	8.89	13.39	U	146,000	
593 FS 413		5-12-44	McPherson, H. L.	1.0313	4.0	8.64	12.64	S	11,000	
197 FS 135		9-1-44	McPherson, H. L.	1.0313	4.2	8.68	12.88	C	186,000	
786 H 51		1-26-45	McPherson, H. L.	1.0308	4.1	8.53	12.63	C	9,000	
597 FS 417		5-12-44	Rollins, C. E.	1.0305	4.1	8.46	12.56	S	278,000	
948 H 131		2-14-45	Rollins, C. E.	1.0314	6.0	9.08	15.08	U	94,000	
782 H 47		1-26-45	Rollins, W. E.	1.0326	4.9	9.15	14.05	U	500,000	
HAMPDEN										
3050 R 268*		3-1-45	Dority, Frank J.	1.0310	4.0	8.56	12.56	S	21,000	No bacteria count made No bacteria count made No bacteria count made No bacteria count made No bacteria count made
743 R 97		10-26-44	Gilmore, Lawrence C.	1.0327	5.0	9.20	14.20	S	251,000	
736 R 192		1-12-45	Gilmore, Lawrence, C.	1.0326	4.7	9.11	13.81	U	10,000	
3226 R 315		4-11-45	Gilmore, Lawrence C.	1.0331	3.8	9.05	12.85	S	21,000	
744 R 98		10-27-44	Perry, N. Searle	1.0325	3.7	8.88	12.58	U		
745 R 99		10-27-44	Perry, N. Searle	1.0337	4.7	9.39	14.09	U		
746 R 100		10-27-44	Perry, N. Searle	1.0313	5.7	8.99	14.69	U		
747 R 101		10-27-44	Perry, N. Searle	1.0323	5.5	9.20	14.70	U		
748 R 102		10-27-44	Perry, N. Searle	1.0320	4.3	8.88	13.18	U		
742 R 96		10-26-44	Swett & Sons, W. E.	1.0324	3.9	8.89	12.79	C	238,000	
737 R 193		1-12-45	Swett & Sons, W. E.	1.0315	3.7	8.63	12.33	C	143,000	
3225 R 314		4-11-45	Swett & Sons, W. E.	1.0324	3.4	8.79	12.19	S	217,000	
HANCOCK										
7014 S 249		11-30-44	Carter, Harvard	1.0342	6.3	9.95	16.25	S	47,000	
7015 S 250		11-30-44	Clark, Robert	1.0335	6.0	9.61	15.61	S	45,000	
HARTLAND										
3830 S 4		7-10-44	Nelson, Philip	1.0304	4.4	8.49	12.89	U	188,000	
3836 S 186		10-23-44	Nelson, Philip	1.0320	4.9	9.25	14.15	U	17,000	
3066 S 360		3-5-45	Nelson, Philip	1.0320	3.8	8.77	12.57	S	17,000	
3067 S 361		3-5-45	Nelson, Philip	1.0329	3.8	9.00	12.80	U	500,000	
3065 S 359		3-5-45	Shorey, Lee	1.0312	5.5	8.22	14.42	U	290,000	

Table showing the results of the analyses of samples of raw milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
HODGDON										
17049	R 29	8-8-44	Glidden, Luther	1.0310	5.1	8.79	13.89	C	32,000	
17050	R 30	8-8-44	Kervin, Douglas	1.0320	4.6	8.94	13.54	S	103,000	
17048	R 28	8-8-44	Wilson, Robert A.	1.0300	4.8	8.47	13.27	S	54,000	
HOULTON										
17040	R 20	8-8-44	Benn, E. Shirley	1.0306	5.3	8.72	14.02	U	220,000	
18008	R 237	2-23-45	Benn, E. Shirley	1.0343	5.6	9.73	15.33	S	49,000	
18178	R 279	4-3-45	Benn, E. Shirley	1.0334	4.7	9.31	14.01	S	55,000	
17051	R 31	8-8-44	Benn, George	1.0320	4.9	9.00	13.90	S	26,000	
17047	R 27	8-8-44	Cone, Walter A.	1.0337	4.2	9.11	13.31	C	204,000	
18004	R 233	2-23-45	Cone, Walter A.	1.0343	5.0	9.60	14.60	U	122,000	
18005	R 234	2-23-45	Cone, Walter A.	1.0325	5.1	8.92	14.02	U	9,000	
18183	R 284	4-3-45	Cone, Walter A.	1.0327	4.0	8.99	12.99	C	9,000	
17052	R 32	8-8-44	Fitzpatrick, Jerry	1.0310	4.6	8.68	13.28	S	1,460,000	
18003	R 232	2-23-45	Fitzpatrick, Paul	1.0305	3.9	8.44	12.34	S	318,000	
18180	R 281	4-3-45	Fitzpatrick, Paul	1.0306	4.1	8.48	12.58	S	187,000	
18011	R 240	2-23-45	Kervin, Douglas	1.0297	3.9	8.22	12.12	U	14,000	
17044	R 24	8-8-44	McCarty, Beulah	1.0317	5.0	8.94	13.94	C	432,000	
18166	R 287	4-3-45	McCready, John	1.0319	3.8	8.75	12.55	U	40,000	
17046	R 26	8-8-44	MacPherson, Fred	1.0297	4.3	8.30	12.60	U	40,000	
18007	R 236	2-23-45	MacPherson, Fred	1.0345	5.7	9.80	15.50	U	38,000	
17039	R 19	8-8-44	Mooers, Albert E., Jr.	1.0308	5.3	8.77	14.07	S	447,000	
18010	R 289	2-23-45	Mooers, Albert E., Jr.	1.0305	5.6	8.77	14.37	S	76,000	
17042	R 22	8-8-44	Toner, Edward N.	1.0320	5.0	9.02	14.02	S	17,000	
18002	R 231	2-23-45	Toner, Edward N.	1.0337	4.6	9.37	13.97	C	37,000	
18184	R 285	4-3-45	Toner, Edward N.	1.0327	5.0	9.20	14.20	C	13,000	
17043	R 23	8-8-44	Williams, R. W.	1.0315	5.5	9.00	14.50	S	5,000	
18006	R 235	2-23-45	Williams, R. W.	1.0315	4.5	8.79	13.29	U	28,000	
18179	R 280	4-3-45	Williams, R. W.	1.0335	4.7	9.34	14.04	S	5,000	
18185	R 286	4-3-45	Wilson, Robert	1.0329	4.3	9.11	13.41	S	40,000	
HOWLAND										
17524	R 122	11-8-44	Dobson, L. L.	1.0330	5.8	9.44	15.24	U	70,000	
17532	R 130	11-8-44	Drake, Frank	1.0325	4.5	9.05	13.55	S	194,000	
17531	R 129	11-8-44	Smart, Clarence	1.0331	3.6	9.01	12.61	S	132,000	
17533	R 131	11-8-44	Tunks, Benjamin	1.0323	5.2	9.14	14.34	U	12,000	
JAY										
16990	FS 36	7-29-44	Donald, John	1.0327	4.1	9.01	13.11	U	18,000	
JONESPORT										
10955	S 27	7-26-44	Davis, Alton C.	1.0311	4.3	8.65	12.95	U	82,000	
10956	S 28	7-26-44	Mansfield, Mrs. Bertha	1.0317	4.2	8.78	12.98	U	15,000	Sediment test on one-half pint
KENNEBUNK										
16641	AJ 241	5-27-44	Hammond, P. R.	1.0327	4.3	9.06	13.36	C	7,239,000	
17003	AJ 58	7-29-44	Hammond, P. R.	1.0320	4.8	8.98	13.78	U	71,000	

Table showing the results of the analyses of samples of raw milk

Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count— Colonies per c.c.	Remarks
Kennebunk—Cont.									
9 AJ 239	5-27-44	Kimball, E. L.	1.0327	3.2	8.83	12.03	C	191,000	Below standard in fat
4 AJ 59	7-29-44	Kimball, E. L.	1.0320	4.0	8.81	12.81	U	950,000	
1 AJ 56	7-29-44	Roberts, Cora	1.0320	5.0	9.02	14.02	S	162,000	
7 AJ 237	5-27-44	Smith, Earl M.	1.0337	5.6	9.58	15.18	S	151,000	
9 AJ 64	7-29-44	Smith, Earl M.	1.0300	4.3	8.37	12.67	S	640,000	
8 AJ 238	5-27-44	Spiller, R. A.	1.0308	4.4	8.59	12.99	S	12,000	
6 AJ 236	5-27-44	Stahl, J. W.	1.0337	4.9	9.43	14.33	C	3,493,000	
0 AJ 55	7-29-44	Stahl, J. W.	1.0340	4.7	9.46	14.16	S	8,953,000	
0 AJ 240	5-27-44	Stewart, O. W.	1.0317	4.1	8.72	12.82	S	14,000	
2 AJ 57	7-29-44	Stewart, O. W.	1.0320	3.7	8.75	12.45	S	69,000	
KENNEBUNKPORT									
7 AJ 62	7-29-44	McCabe, James	1.0330	4.1	9.08	13.18	U	242,000	Below standard in fat and total solids
6 AJ 61	7-29-44	Wildes, L. E.	1.0310	3.2	8.40	11.60	S	1,016,000	
KINGFIELD									
8 FS 16	7-13-44	Brackley, A. L.	1.0320	5.2	9.06	14.26	C	11,000	
6 CO 36	10-26-44	Brackley, A. L.	1.0337	5.4	9.54	14.94	U	12,000	
9 FS 17	7-13-44	Brindley, A. R.	1.0320	4.7	8.96	13.66	S	452,000	
5 CO 35	10-26-44	Brindley, A. R.	1.0334	5.3	9.43	14.73	S	146,000	
KITTERY and ELIOT									
3 AJ 74	8-4-44	Bartlett & Sons, W. S.	1.0298	3.3	8.14	11.44	S		No bacteria count made. Below standard in total solids
1 AJ 72	8-4-44	Moulton, Mrs. Mary	1.0305	3.4	8.32	11.72	S		
0 AJ 71	8-4-44	Raynes, William F.	1.0323	4.8	9.06	13.86	C	39,000	No bacteria count made. Below standard in total solids
8 AJ 69	8-4-44	Walker, H. L.	1.0320	3.9	8.79	12.69	U	100,000	
LEWISTON and AUBURN									
9 AJ 135	10-21-44	B & B Dairy	1.0329	4.6	9.16	13.76	U	97,000	
6 AJ 223	1-3-45	B & B Dairy	1.0314	4.6	8.78	13.38	U	140,000	
6 AJ 226	1-4-45	Bergeron Dairy	1.0314	4.2	8.70	12.90	U	26,000	
5 FS 84	8-18-44	Berry, L. M.	1.0310	5.0	8.76	13.76	C	1,016,000	
4 H 143	2-15-45	Berry, L. M.	1.0340	4.8	9.48	14.28	U	4,000	
1 AJ 117	10-19-44	Blais Dairy	1.0309	4.2	8.58	12.78	C	361,000	
9 AJ 203	11-21-44	Blais Dairy	1.0320	4.8	8.98	13.78	S	635,000	
2 AJ 219	1-3-45	Blais Dairy	1.0325	4.3	9.01	13.31	S	30,000	
8 H 4	1-20-45	Blais Dairy	1.0319	4.0	8.79	12.79	C	468,000	
2 H 223	3-29-45	Blais Dairy	1.0318	3.8	8.72	12.52	U	664,000	
8 FS 57	8-16-44	Bolduc, Edward	1.0313	4.1	8.66	12.76	U	51,000	
3 H 152	2-17-45	Bolduc, Edward	1.0331	4.4	9.18	13.58	S	15,000	
0 H 241	3-30-45	Bolduc, Edward	1.0313	4.3	8.70	13.00	S	13,000	
3 FS 92	8-19-44	Briggs, W. W.	1.0309	3.6	8.45	12.05	S	1,860,000	
9 H 158	2-17-45	Briggs, W. W.	1.0301	3.6	8.26	11.86	C	740,000	
1 H 232	3-29-45	Briggs, W. W.	1.0324	4.0	8.91	12.91	U	1,000,000	

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Table showing the results of the analyses of samples of raw milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
Lewiston and Auburn—Cont.										
17747	H 3	1-20-45	Caron, Charles	1.0314	3.8	8.62	12.42	S	332,000	
17141	FS 80	8-18-44	Carvill, A. H.	1.0310	4.7	8.70	13.40	S	762,000	
17974	H 153	2-17-45	Carvill, A. H.	1.0324	4.0	8.91	12.91	S	26,000	
17107	FS 46	8-16-44	Casavant, Antonio	1.0315	3.9	8.67	12.57	O	137,000	
17989	H 167	2-21-45	Casavant, Antonio	1.0325	4.4	9.03	13.43	S	15,000	
18130	H 221	3-29-45	Casavant, Antonio	1.0329	3.6	8.96	12.56	S	73,000	
17750	H 6	1-20-45	Cote's Dairy	1.0340	4.0	9.32	13.32	C	131,000	
17960	H 139	2-15-45	Crockett, A. D.	1.0340	4.4	9.40	13.80	U	5,000	
17134	FS 73	8-18-44	Delektto Dairy	1.0308	4.2	8.55	12.75	U	762,000	
17971	H 150	2-15-45	Delektto Dairy	1.0304	3.8	8.37	12.17	U		No bacteria count
18146	H 237	3-30-45	Delektto Dairy	1.0300	3.8	8.27	12.07	U	101,000	
17679	AJ 216	1- 3-45	Drapeau & Sons, Emll	1.0309	3.7	8.47	12.17	S	11,000	
17119	FS 58	8-16-44	Drapeau, Helen	1.0303	4.1	8.41	12.51	C	406,000	
17977	H 156	2-17-45	Drapeau, Helen	1.0300	3.8	8.27	12.07	C	188,000	
18145	H 236	3-30-45	Drapeau, Helen	1.0306	3.6	8.38	11.98	C	88,000	
17688	AJ 225	1- 3-45	Drapeau, Reginald J.	1.0317	3.6	8.66	12.26	U	544,000	
17738	AJ 236	1-13-45	Drapeau, Reginald J.	1.0232	3.6	6.44	10.04		15,000	No sediment test Below standard solids. Added water
17741	AJ 239	1-13-45	Drapeau, Reginald J.	1.0318	4.7	8.88	13.58	U	90,000	
17742	AJ 240	1-13-45	Drapeau, Reginald J.	1.0315	3.5	8.59	12.09	S	89,000	
17743	AJ 241	1-13-45	Drapeau, Reginald J.	1.0329	4.3	9.11	13.41	S	170,000	
17753	H 9	1-20-45	Drapeau, Reginald J.	1.0324	4.1	8.93	13.03	S	84,000	
17754	H 10	1-20-45	Drapeau, Reginald J.	1.0325	4.0	8.94	12.94	C	280,000	
17982	H 161	2-17-45	Drapeau, Reginald J.	1.0317	4.3	8.80	13.10	S		No bacteria count
18142	H 233	3-29-45	Drapeau, Reginald J.	1.0315	4.1	8.71	12.81	U	442,000	
17752	H 8	1-20-45	Dumont & Co., E.	1.0334	3.9	9.14	13.04	S	81,000	
18124	H 215	3-29-45	Dumont & Co., E.	1.0325	3.3	8.80	12.10	S	43,000	
17128	FS 67	8-16-44	Gendron, Arthur C.	1.0305	3.7	8.39	12.08	S	246,000	
17954	H 163	2-21-45	Gendron, Arthur C.	1.0329	3.5	8.94	12.44	S	16,000	
17142	FS 81	8-18-44	Goss, F. F.	1.0340	3.5	9.22	12.72	S	89,000	
17961	H 140	2-15-45	Goss, F. F.	1.0326	4.3	9.03	13.33	S	20,000	
18149	H 240	3-30-45	Goss, F. F.	1.0318	5.4	9.05	14.45	S	14,000	
17122	FS 61	8-16-44	Goyette, Maurice	1.0304	4.1	8.43	12.53	S	210,000	
17988	H 166	2-21-45	Goyette, Maurice	1.0311	4.2	8.63	12.83	S	90,000	
18131	H 222	3-29-45	Goyette, Maurice	1.0318	3.9	8.74	12.64	S	56,000	
17149	FS 88	8-18-44	Hathaway, B. W.	1.0313	4.6	8.76	13.36	S	6,715,000	
17114	FS 53	8-16-44	Hodgkin, C. P.	1.0320	4.9	9.00	13.90	S	400,000	
17990	H 168	2-21-45	Hodgkin, C. P.	1.0339	4.5	9.40	13.90	S	13,000	
18135	H 226	3-29-45	Hodgkin, C. P.	1.0330	3.9	9.04	12.94	U	13,000	
17146	FS 85	8-18-44	Hodgkins, E. O.	1.0320	4.5	8.92	13.42	S	178,000	
17965	H 144	2-15-45	Hodgkins, E. O.	1.0328	5.1	9.24	14.34	S	92,000	
17155	FS 94	8-19-44	Hodgkins, M. A.	1.0335	4.3	9.26	13.56	C	9,000	
17959	H 138	2-15-45	Hodgkins, M. A.	1.0335	5.1	9.42	14.52	U	16,000	
18148	H 239	3-30-45	Hodgkins, M. A.	1.0327	4.2	9.03	13.23	C	6,000	
17144	FS 83	8-18-44	Irish, Mrs. Agnes S.	1.0330	5.0	9.27	14.27	C	100,000	
17932	H 141	2-15-45	Irish, Mrs. Agnes S.	1.0350	5.7	9.92	15.62	U	8,000	
17969	H 148	2-15-45	Irish, C. E.	1.0320	3.6	8.73	12.33	S		No bacteria count
17129	FS 68	8-16-44	Jackson, J. S.	1.0315	4.9	8.87	13.77	S	1,077,000	
17365	AJ 121	10-19-44	Jackson, J. S.	1.0301	4.8	8.70	13.50	U	20,000	
17981	H 160	2-17-45	Jackson, J. S.	1.0339	4.3	9.36	13.66	U	5,000	
17154	FS 93	8-19-44	James & Sons, F. H.	1.0315	4.7	8.93	13.53	S	65,000	
17578	AJ 192	11-21-44	James & Sons, F. H.	1.0320	4.0	8.81	12.81	S	134,000	
17116	FS 55	8-16-44	LaFrance, Joseph	1.0313	4.1	8.66	12.76	C	392,000	
17985	H 164	2-21-45	LaFrance, Joseph	1.0320	4.0	8.81	12.81	U	64,000	

Table showing the results of the analyses of samples of raw milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
Lewiston and Auburn—Cont.										
7130 FS 69		8-18-44	Lajoie, Peter	1.0317	4.4	8.82	13.22	C	274,000	
7983 H 162		2-21-45	Lajoie, Peter	1.0311	4.5	8.09	13.19	S	5,000	
8139 H 230		3-29-45	Lajoie, Peter	1.0323	4.3	8.96	13.26	S	15,000	
7135 FS 74		8-18-44	Lane, Carl E.	1.0308	4.2	8.55	12.75	C	107,000	
7970 H 149		2-15-45	Lane, Carl E.	1.0308	4.5	8.61	13.11	U	73,000	
7587 A J 201		11-21-44	Laneville, Henry	1.0320	3.7	8.75	12.46	S	79,000	
7751 H 7		1-20-45	Laneville, Henry	1.0315	3.8	8.65	12.45	C	3,000†	
7993 H 171		2-21-45	Laneville, Henry	1.0313	5.1	8.87	13.97	S	483,000	
7136 FS 75		8-18-44	Leclair, J. M.	1.0337	4.4	9.33	13.73	C	105,000	
7138 FS 77		8-18-44	Levasseur, Donat	1.0298	3.4	8.14	11.54	S	352,000	Below standard in total solids
8144 H 235		3-30-45	Levasseur, Donat	1.0299	3.0	8.08	11.08	U	183,000	Below standard in fat and total solids
7110 FS 49		8-16-44	Levesque, Joseph	1.0319	4.4	8.86	13.26	S	1,968,000	
7683 A J 220		1- 3-45	Levesque, Joseph	1.0323	4.1	8.91	13.01	U		No bacteria count made
7745 H 1		1-20-45	Levesque, Joseph	1.0314	4.1	8.68	12.78	U	334,000	
7991 H 169		2-21-45	Levesque, Joseph	1.0325	3.4	8.82	12.22	U	127,000	
8128 H 219		3-29-45	Levesque, Joseph	1.0327	3.1	8.81	11.91	U	30,000	Below standard in fat
7363 A J 119		10-19-44	Macomber's Dairy	1.0319	4.9	8.97	13.87	S	33,000	
7585 A J 199		11-21-44	Macomber's Dairy	1.0309	3.7	8.47	12.17	S	41,000	
7746 H 2		1-20-45	Malenfant Dairy	1.0323	3.8	8.85	12.65	S	3,000†	
7157 FS 96		8-19-44	Merrill, Albert	1.0316	4.4	8.79	13.19	C	25,000	
7972 H 151		2-17-45	Merrill, Albert	1.0349	5.9	9.94	15.84	U	248,000	
7108 FS 47		8-16-44	Millard, Joseph	1.0308	3.8	8.45	12.25	S	290,000	
7125 FS 64		8-16-44	Parsons, Howard M.	1.0326	5.9	9.36	15.26	S	351,000	
7966 H 145		2-15-45	Parsons, Howard M.	1.0328	4.8	9.18	13.98	U	50,000	
7137 FS 76		8-18-44	Robinson Est., R. A.	1.0298	4.3	8.32	12.62	U	204,000	
7978 H 157		2-17-45	Robinson Est., R. A.	1.0300	3.8	8.27	12.07	S	80,000	
7968 H 147		2-15-45	Rollins, O. F.	1.0342	5.4	9.66	15.06	U	13,000	
7975 H 154		2-17-45	Schoppe, W. F.	1.0339	5.5	9.61	15.11	S	30,000	
7749 H 5		1-20-45	Sherman, Cecil	1.0220	3.6	5.79	9.39	U	13,000	No sediment test made. Below standard in total solids. Added water
7112 FS 51		8-16-44	Simoneau, Romeo	1.0300	4.2	8.35	12.55	U	633,000	
7987 H 165		2-21-45	Simoneau, Romeo	1.0316	3.5	8.61	12.11	S	540,000	
8126 H 217		3-29-45	Simoneau, Romeo	1.0306	3.5	8.36	11.86	S	708,000	
7109 FS 48		8-16-44	Stukas, Anthony	1.0308	4.0	8.51	12.51	C	768,000	
7992 H 170		2-21-45	Stukas, Anthony	1.0321	3.5	8.74	12.24	U	17,000	
8134 H 225		3-29-45	Stukas, Anthony	1.0321	3.7	8.78	12.48	C	20,000	
7158 FS 97		8-19-44	Waterman, Ira H.	1.0306	4.0	8.46	12.46	C	16,000	
7377 A J 133		10-21-44	Waterman, Ira H.	1.0320	4.3	8.88	13.18	C	15,000	
7582 A J 196		11-21-44	Waterman, Ira H.	1.0310	4.2	8.60	12.80	S	5,000	
7147 FS 86		8-18-44	White, H. S.	1.0305	4.1	8.46	12.56	S	13,000	
7383 A J 139		10-21-44	White, H. S.	1.0332	5.1	9.34	14.44	U	37,000	
7581 A J 195		11-21-44	White, H. S.	1.0330	4.9	9.25	14.15	U	117,000	
7703 A J 233		1- 4-45	White, H. S.	1.0330	4.9	9.25	14.15	S	552,000	
8153 H 244		3-30-45	Whiteholm Dairy	1.0330	4.7	9.21	13.91	S	130,000	
7980 H 159		2-17-45	Wright, F. L.	1.0339	5.2	9.80	15.00	U	3,000†	
LIMESTONE										
7088 R 45		8-10-44	Phair, Ed.	1.0330	5.0	9.27	14.27	C	3,000†	

Less than.

Table showing the results of the analyses of samples of raw milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
LINCOLN										
17527	R 125	11- 8-44	Hobbs, Lester	1.0335	4.7	9.34	14.04	U	20,000	
18030	R 248	2-24-45	Hobbs, Lester	1.0300	4.5	8.41	12.91	S	722,000	
17530	R 128	11- 8-44	Kneeland, Ardie	1.0296	4.0	8.21	12.21	U	18,000	
17528	R 126	11- 8-44	Knights, Bessie E.	1.0325	4.9	9.13	14.03	C	12,000	
18031	R 249	2-24-45	Knights, Bessie E.	1.0323	4.5	9.00	13.50	C	14,000	
17529	R 127	11- 8-44	Weymouth, Ollie	1.0334	4.4	8.25	13.65	U	13,000	
17533	R 124	11- 8-44	Whalen, Dan	1.0301	4.4	8.42	12.82	S	300,000	
18029	R 247	2-24-45	Whalen, Dan	1.0295	4.0	8.31	12.91	C	210,000	
LISBON FALLS										
17891	H 92	2- 7-45	Allen, Raymond	1.0325	5.1	9.17	14.27	C	3,000	
17884	H 85	2-7-45	Bowie, Hubert A.	1.0328	4.7	9.16	13.86	S	136,000	
18018	H 172	2-23-45	Bowie, Hubert A.	1.0323	4.9	9.08	13.98	S	488,000	
18022	H 176	2-23-45	Griffin & Son, H. L.	1.0332	4.9	9.30	14.20	C	231,000	
17889	H 90	2- 7-45	Katula, Joseph	1.0254	3.2	6.82	10.02		3,000†	No sediment test made Below standard in fat and total solids. Added water
18020	H 174	2-23-45	Katula, Joseph	1.0323	4.6	9.02	13.62	U	84,000	
17890	H 91	2- 7-45	Reynolds, Edgar	1.0294	9.5	9.39	18.89	U	363,000	
18021	H 175	2-23-45	Reynolds, Edgar	1.0323	5.6	9.23	14.83	U	1,000,000†	
17883	H 74*	2- 7-45	Ricker, Howard	1.0318	4.6	8.88	13.48	S	72,000	
17885	H 86	2- 7-45	Ross, Levi M.	1.0331	4.0	8.09	13.09	S	8,000	
17887	H 88	2- 7-45	Warren, Eva	1.0318	4.2	8.80	13.00	U	472,000	
18019	H 173	2-23-45	Warren, Eva	1.0333	3.7	9.08	12.78	S	84,000	
LITCHFIELD										
17861	H 67	1-27-45	Ladd, Wesley	1.0356	6.8	9.68	16.48	U	31,000	
17863	H 69	1-27-45	Maxwell, Leslie C.	1.0340	5.3	9.58	14.88	U	10,000	
17864	H 70	1-27-45	Woodard, O. V.	1.0341	5.9	9.74	15.64	U	470,000	
LIVERMORE FALLS										
16820	FS 530	6-30-44	Botka, Andrew	1.0320	4.4	8.90	13.30	C	90,000	
16822	FS 532	6-30-44	Labrecque, E. L.	1.0320	5.0	9.02	14.02	C	180,000	
17572	CO 49	11-16-44	Labrecque, E. L.	1.0324	4.5	9.02	13.52	S	164,000	
16824	FS 534	6-30-44	Tardiff, John	1.0320	4.7	8.70	13.40	C	4,000	
LUBEC										
16963	S 35	7-26-44	Andrews, N. F.	1.0335	4.3	9.26	13.56	S	100,000	
16964	S 36	7-26-44	Blanch Bros.	1.0305	3.5	8.34	11.84	U	57,000	
17326	S 173	10- 5-44	Blanch Bros.	1.0315	3.4	8.57	11.97	C		No bacteria count made
17521	S 226	11- 2-44	Blanch Bros.	1.0313	4.2	8.68	12.88	C	13,000	
17523	S 228	11- 2-44	Eaton, Arnold	1.0330	3.7	9.00	12.70	U	12,000	
17520	S 225	11- 2-44	Gilpatrick, Charles	1.0303	3.7	8.33	12.03	S	81,000	
17329	S 176	10- 5-44	Gilpatrick, R. S.	1.0326	4.0	8.96	12.96	U		No bacteria count made
16962	S 34	7-26-44	Hamilton, Horace	1.0323	3.5	8.79	12.29	S	2,288,000	
16965	S 37	7-26-44	Myers, Lee	1.0315	3.0	8.49	11.49	U	474,000	Below standard in fat and total solids
17327	S 174	10- 5-44	Myers, Lee	1.0313	3.8	8.60	12.40	C		No bacteria count made

† Less than.

‡ Greater than.

Table showing the results of the analyses of samples of raw milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
Lubec—Cont.										
7518	S 223	11- 2-44	Myers, Lee	1.0311	3.5	8.49	11.99	C	35,000	No bacteria count made
7519	S 224	11- 2-44	Myers, Lee	1.0313	3.5	8.54	12.04	C	147,000	
6961	S 33	7-26-44	Towse, Oscar	1.0331	4.3	9.16	13.46	U	170,000	
7328	S 175	10- 5-44	Towse, Oscar	1.0323	5.4	9.44	14.84	U		
7522	S 227	11- 2-44	Towse, Oscar	1.0335	5.3	9.46	14.76	S	151,000	
MACHIAS										
6957	S 29	7-26-44	Hill, Edwin W.	1.0313	4.3	8.70	13.00	U	480,000	No bacteria count made
7322	S 169	10- 5-44	Hill, Edwin W.	1.0322	5.5	9.17	14.67	U		
7512	S 217	11- 2-44	Hill, Edwin W.	1.0318	3.8	8.72	12.52	C	7,000	
6966	S 38	7-26-44	Holmes, Leon	1.0335	3.8	9.15	12.95	U	54,000	No bacteria count made
7330	S 177	10- 5-44	Holmes, Leon	1.0330	5.4	9.36	14.76	U		
7516	S 221	11- 2-44	Holmes, Leon	1.0336	4.8	9.41	14.21	S	8,000	
7514	S 219	11- 2-44	McKenney, H. B.	1.0309	4.5	8.63	13.13	S	7,000	
6960	S 32	7-26-44	Palmer, Foreston A.	1.0315	4.1	8.63	12.73	U	17,000	
7517	S 222	11- 2-44	Palmer, Foreston A.	1.0313	4.5	8.74	13.24	U	13,000	No bacteria count made
6958	S 30	7-26-44	Schoppee, Millard	1.0313	4.1	8.66	12.76	U	58,000	
7323	S 170	10- 5-44	Schoppee, Millard	1.0313	4.3	8.70	13.00	U		
7515	S 220	11- 2-44	Schoppee, Millard	1.0320	4.0	8.81	12.81	C	19,000	
6959	S 31	7-26-44	Schoppee, N. F.	1.0323	3.8	8.85	12.65	U	272,000	
7324	S 171	10- 5-44	Schoppee, N. F.	1.0330	4.0	9.06	13.06	S		No bacteria count made
7513	S 218	11- 2-44	Schoppee, N. F.	1.0320	4.0	8.81	12.81	U	43,000	
MADISON and ANSON										
7233	S 105	9- 8-44	Ouellette, A. H.	1.0325	4.1	9.23	13.33	S	136,000	
7357	S 270	12-21-44	Ouellette, A. H.	1.0325	4.5	9.05	13.55	S	52,000	
7654	S 267	12-21-44	Paine, Mrs. Ella C.	1.0323	4.9	9.08	13.98	C	66,000	
7230	S 102	9- 8-44	Weston, E. C.	1.0334	5.0	9.37	14.37	C	5,000	
MANCHESTER										
6574	FS 394	5- 9-44	Hawkes, Elliott	1.0325	5.0	9.15	14.15	S	41,000	
7166	FS 104	8-30-44	Hawkes, Elliott	1.0327	5.2	9.24	14.44	U	70,000	
7895	H 71	1-27-45	Hawkes, Elliott	1.0348	4.4	9.60	14.00	C	20,000	
6573	FS 393	5- 9-44	Lenfest, E. N.	1.0335	4.5	9.30	13.80	C	13,000	
MARS HILL										
7057	R 37	8- 9-44	Hotham, Ralph L.	1.0323	4.5	9.00	13.50	C	370,000	Sediment test on one-half pint
7059	R 39	8- 9-44	Libby, Thomas	1.0313	4.7	8.73	13.43	S	1,066,000	
7050	R 36	8- 9-44	Pierce, Franklin	1.0303	4.8	8.55	13.35	S	143,000	
MECHANIC FALLS										
6748	FS 482	6-28-44	Burgess, Kenneth	1.0313	4.6	8.78	13.38	U	446,000	
6746	FS 480	6-28-44	Hemphill, S. H.	1.0332	5.5	9.43	14.93	S	21,000	
6747	FS 481	6-28-44	Hemphill, S. H.	1.0320	4.7	8.96	13.66	S	64,000	
6749	FS 483	6-28-44	Tanner, Clifton W.	1.0313	5.5	8.95	14.45	S	1,062,000	
7375	AJ 131	10-21-44	Tanner, Clifton W.	1.0334	4.5	9.27	13.77	C	291,000	

Table showing the results of the analyses of samples of raw milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
MEXICO										
16813	FS 523	6-30-44	Virgin, H. O.	1.0305	4.1	8.40	12.56	C	24,000	
MILLINOCKET and EAST MILLINOCKET										
17535	R 133	11-9-44	Boddy, Mrs. W. J.	1.0315	3.8	8.65	12.45	C	8,000	
17536	R 134	11-9-44	Boddy, Mrs. W. J.	1.0308	4.2	8.55	12.75	U	19,000	
17537	R 135	11-9-44	Boddy, Mrs. W. J.	1.0330	5.0	9.27	14.27	S	11,000	
17538	R 136	11-9-44	Boddy, Mrs. W. J.	1.0327	4.9	9.18	14.08	U	281,000	
17551	R 149	11-9-44	Jones, George E.	1.0279	2.9	7.53	10.43		889,000	No sediment test made. Below standard in fat and total solids. Added water
17552	R 150	11-9-44	Jones, George E.	1.0315	4.5	8.81	13.31	U	83,000	
17553	R 151	11-9-44	Jones, George E.	1.0317	3.8	8.70	12.50	U	30,000	
17543	R 141	11-9-44	Keeley, E. G.	1.0310	4.0	8.56	12.56	S	24,000	
17544	R 142	11-9-44	Keeley, E. G.	1.0330	4.9	9.25	14.15	U	143,000	
17545	R 143	11-9-44	Keeley, E. G.	1.0300	4.1	8.33	12.43	S	616,000	
17546	R 144	11-9-44	Keeley, E. G.	1.0303	3.7	8.33	12.03	U	50,000	
17547	R 145	11-9-44	Keeley, E. G.	1.0305	4.1	8.46	12.56	U	45,000	
17554	R 152	11-10-44	LaPointe, H. E.	1.0320	3.6	8.73	12.33	U	11,000	
17539	R 137	11-9-44	Mulroney, Jerry	1.0298	3.0	8.05	11.05	U	33,000	Below standard in fat and total solids
17540	R 138	11-9-44	Mulroney, Jerry	1.0310	4.8	8.72	13.52	U	104,000	
17541	R 139	11-9-44	Mulroney, Jerry	1.0349	4.7	9.69	14.39	U	65,000	
17542	R 140	11-9-44	Mulroney, Jerry	1.0300	4.3	8.37	12.67	U	193,000	
17555	R 153	11-10-44	Murray, Frank A.	1.0319	4.3	8.85	13.15	U	1,133,000	
17548	R 146	11-9-44	Rush, B. F.	1.0315	3.6	8.61	12.21	S	16,000	
17549	R 147	11-9-44	Rush, B. F.	1.0296	3.0	8.00	11.01	S	6,000	Below standard in fat and total solids
17550	R 148	11-9-44	Rush, B. F.	1.0320	3.5	8.71	12.21	U	56,000	
MILO										
16862	S 22	7-12-44	Brookway & Son, E. W.	1.0321	4.3	8.91	13.21	S	141,000	
17427	S 214	10-25-44	Brookway & Son, E. W.	1.0308	4.2	8.55	12.75	S	288,000	
18083	S 377	3-7-45	Brookway, W. A.	1.0331	4.3	9.16	13.46	S	60,000	
16863	S 23	7-12-44	Brown, D. L.	1.0310	3.6	8.48	12.08	O	74,000	
18084	S 378	3-7-45	Brown, D. L.	1.0330	4.2	9.11	13.31	S	13,000	
16860	S 20	7-12-44	Downs, William	1.0329	4.0	9.03	13.03	U	862,000	
18081	S 375	3-7-45	Downs, William	1.0330	4.5	9.17	13.67	O	21,000	
16859	S 19	7-12-44	Ricker, R. E.	1.0325	3.2	8.78	11.98	S	9,000	Below standard in fat
17426	S 213	10-25-44	Ricker, R. E.	1.0315	4.2	8.73	12.93	S	18,000	
18085	S 379	3-7-45	Ricker, R. E.	1.0332	4.9	9.30	14.20	C	11,000	
MONMOUTH										
17161	FS 100	8-19-44	Smith, H. P.	1.0327	3.8	8.95	12.75	S		No bacteria count made
MONSON										
17419	S 206	10-25-44	Forbus, Max C.	1.0333	4.6	9.27	13.87	S	18,000	
17418	S 205	10-25-44	Huff, Mrs. Moses	1.0323	4.5	9.00	13.50	O	9,000	
17421	S 208	10-25-44	Wynman, Merle B.	1.0318	4.5	8.86	13.36	U	20,000	

Table showing the results of the analyses of samples of raw milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count - Colonies per c.c.	Remarks
MONTICELLO										
17053 R 33		8-9-44	Foster, J. M.	1.0325	5.7	9.30	15.00	C	50,000	
MOUNT DESERT										
16623 S 285		5-24-44	Richardson, P. S.	1.0315	3.8	8.65	12.45	S	11,000	
17073 S 71		8-9-44	Richardson, P. S.	1.0330	4.4	9.15	13.55	S	3,000†	
NEWPORT										
17011 R 15		7-31-44	Brawn Est., H. V.	1.0300	3.4	8.19	11.59	C	92,000	Below standard in total solids
17337 R 78		9-17-44	Brawn Est., H. V.	1.0326	4.4	9.05	13.45	S	27,000	
18219 R 308		4-11-45	Brawn Est., H. V.	1.0321	3.8	8.80	12.60	S	12,000	
17012 R 16		7-31-44	Rowe, Edward G.	1.0340	3.7	9.26	12.96	S	726,000	
17339 R 80		9-17-44	Rowe, Edward G.	1.0345	4.4	9.53	13.93	S	46,000	
18218 R 307		4-11-45	Rowe, Edward G.	1.0349	4.3	9.61	13.91	U	70,000	
17014 R 18		7-31-44	Turner, Herbert L.	1.0315	4.3	8.65	12.95	C	18,000	
17343 R 84		9-17-44	Turner, Herbert L.	1.0318	4.5	8.76	13.26	C	236,000	
17392 S 192		10-23-44	Turner, Herbert L.	1.0320	4.1	8.83	12.93	C	14,000	
18217 R 306		4-11-45	Turner, Herbert L.	1.0314	3.5	8.56	12.06	S	8,000	
17013 R 17		7-31-44	Weymouth, Earl	1.0315	3.6	8.61	12.21	S	111,000	
17338 R 79		9-17-44	Weymouth, Earl	1.0311	4.3	8.65	12.95	S	21,000	
NEW PORTLAND										
16867 FS 15		7-13-44	Strickland, F. A.	1.0313	5.6	9.07	14.67	S	73,000	
NEW VINEYARD										
16883 FS 31		7-13-44	Robbins, A. L.	1.0304	4.8	8.57	13.37	S	13,000	
17457 CO 37		10-26-44	Robbins, A. L.	1.0325	5.9	9.34	15.24	S	81,000	
NORRIDGEWOCK										
17228 S 100		9-8-44	Taylor, Ralph B.	1.0318	3.7	8.70	12.40	C	3,000†	
17647 S 230		12-21-44	Taylor, Ralph B.	1.0335	5.0	9.40	14.40	S	23,000	
17229 S 101		9-8-44	Tuttle, Ellery B.	1.0307	4.7	8.63	13.33	U	762,000	
17648 S 261		12-21-44	Tuttle, Ellery B.	1.0320	4.4	8.90	13.30	U	22,000	
NORTH ANSON										
17235 S 107		9-8-44	McLean, K. B.	1.0318	4.7	8.90	13.60	S	88,000	
17650 S 263		12-21-44	McLean, K. B.	1.0324	4.1	8.93	13.03	S	99,000	
17234 S 106		9-8-44	Paine, Lester	1.0331	4.4	9.18	13.58	C	12,000	
17649 S 262		12-21-44	Paine, Lester	1.0343	3.2	9.23	12.43	U	21,000	Below standard in fat
NORTHEAST HARBOR										
17071 S 69		8-9-44	Bordeaux, C. G.	1.0320	3.8	8.77	12.57	U	7,000	
17802 R 203		1-25-45	Bordeaux, C. G.	1.0333	4.7	8.29	13.99	S	11,000	
17074 S 72		8-9-44	Lunt, Harold R.	1.0305	5.4	8.73	14.13	U	28,000	

† Less than.

Table showing the results of the analyses of samples of raw milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
NORWAY										
16788	FS 498	6-29-44	Bachelder, Graham	1.0342	4.0	9.37	13.37	C	6,000	
17369	AJ 125	10-20-44	Bachelder, Graham	1.0337	4.8	9.41	14.21	C	3,000	
17348	AJ 124	10-18-44	Bradbury, K. C.	1.0325	4.5	9.05	13.55	C	11,000	
17622	AJ 214	12- 7-44	Bradbury, K. C.	1.0342	4.4	9.45	13.85	C	4,000	
16791	FS 501	6-29-44	Delano, Don	1.0324	4.2	8.95	13.15	C	67,000	
17368	AJ 124	10-20-44	Delano, Don	1.0321	4.6	8.97	13.57	C	22,000	
17623	AJ 215	12- 7-44	Delano, Don	1.0318	5.7	9.11	14.81	C	51,000	
16781	FS 491	6-29-44	Emerson, George	1.0317	4.2	8.78	12.98	C	42,000	
16782	FS 492	6-29-44	Emerson, George	1.0303	3.8	8.35	12.15	U	75,000	
17370	AJ 125	10-20-44	Emerson, George	1.0313	4.1	8.68	12.76	S	53,000	
16780	FS 490	6-29-44	Pride, D. L.	1.0304	4.7	8.55	13.25	U	4,000	
17352	AJ 108	10-18-44	Pride, D. L.	1.0303	3.9	8.37	12.27	S	3,000†	
17621	AJ 213	12- 7-44	Pride, D. L.	1.0312	5.7	9.20	14.90	S	70,000	
16755	FS 489	6-28-44	Robbins, H. A.	1.0335	5.1	9.42	14.52	C	3,000†	
17350	AJ 106	10-18-44	Robbins, H. A.	1.0325	4.8	9.11	13.91	C	296,000	
17351	AJ 107	10-18-44	Robbins, H. A.	1.0327	5.7	9.35	15.05	U	22,000	
16753	FS 487	6-28-44	Roberts, T. B.	1.0305	5.1	8.66	13.76	S	162,000	
17344	AJ 100	10-18-44	Roberts, T. B.	1.0325	4.0	8.94	12.94	U	246,000	
17349	AJ 105	10-18-44	Russell, K. L.	1.0325	5.3	9.21	14.51	S	45,000	
16752	FS 486	6-28-44	Stanton & Son, C. F.	1.0313	4.7	8.78	13.48	C	141,000	
17367	AJ 123	10-20-44	Stanton & Son, C. F.	1.0313	4.0	8.64	12.64	U	50,000	
17619	AJ 211	12- 7-44	Stanton & Son, C. F.	1.0321	4.1	8.86	12.96	U	17,000	
16754	FS 488	6-28-44	Walker, W. H.	1.0325	5.5	9.25	14.75	S	22,000	
17345	AJ 101	10-18-44	Walker, W. H.	1.0323	5.8	9.27	15.07	C	12,000	
OAKLAND										
18228	H 280	4-13-45	Beane & Son, W. F.	1.0320	4.3	8.88	13.18	O		No bacteria count made
17239	S 111	9-12-44	Collier, L. B.	1.0342	4.1	9.39	13.49	S	175,000	
17240	S 112	9-12-44	Gilbert, R. W.	1.0323	4.2	8.91	13.11	S	14,000	
17665	S 278	12-21-44	Gilbert, R. W.	1.0330	4.8	9.23	14.03	C	5,000	
17604	S 277	12-21-44	Walton, K. L.	1.0336	4.1	9.23	13.33	C	31,000	
OLD TOWN										
17284	R 75	9-19-44	Latno & Son, R. J.	1.0320	5.0	9.02	14.02	U	198,000	
17716	R 172	1-10-45	Latno & Son, R. J.	1.0303	3.8	8.35	12.15	U	190,000	
17282	R 73	9-19-44	Martin, Alphonse	1.0315	4.3	8.75	13.05	U	104,000	
17715	R 171	1-10-45	Martin, Alphonse	1.0314	4.0	8.66	12.66	U	97,000	
17280	R 71	9-19-44	Pinkham & Sons, M. L.	1.0300	4.4	8.39	12.79	C	101,000	
17721	R 177	1-10-45	Pinkham & Sons, M. L.	1.0315	4.6	8.81	13.41	U	320,000	
17283	R 74	9-19-44	Stone, Merle A.	1.0300	3.3	8.17	11.47	U	13,000	Below standard in total solids
17718	R 174	1-10-45	Stone, Merle A.	1.0323	3.8	8.85	12.65	S	84,000	
17281	R 72	9-19-44	Welch, E. A.	1.0303	3.7	8.33	12.03	C	73,000	
17719	R 175	1-10-45	Welch, E. A.	1.0303	3.6	8.31	11.91	U	69,000	
ORLAND										
17435	R 91	10-25-44	Snowman, Albea	1.0308	4.7	8.65	13.35	S	177,000	

† Less than

Table showing the results of the analyses of samples of raw milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
ORONO										
17539 R 119		10-31-44	Goodridge, N. E.	1.0329	3.5	8.94	12.44	U	51,000	
17724 R 180		1-10-45	Goodridge, N. E.	1.0325	4.9	9.13	14.03	S	18,000	
17508 R 118		10-31-44	Huddilston, R. W.	1.0337	4.1	9.26	13.36	U	18,000	
17723 R 179		1-10-45	Huddilston, R. W.	1.0315	4.6	8.81	13.41	U	18,000	
17511 R 121		10-31-44	Perkins, Carl V.	1.0300	4.5	8.41	12.91	S	85,000	
17725 R 181		1-10-45	Perkins, Carl V.	1.0306	3.8	8.42	12.22	U	117,000	
17726 R 182		1-10-45	Perkins, Carl V.	1.0308	4.0	8.51	12.51	S	11,000	
OXFORD										
16751 FS 485		6-28-44	Merrill, R. O.	1.0332	4.4	9.20	13.60	O	69,000	
17617 AJ 209		12- 7-44	Merrill, R. O.	1.0340	5.3	9.58	14.88	U	5,000	
PARIS										
16790 FS 500		6-29-44	Card, L. B.	1.0311	4.0	8.59	12.59	O	372,000	
17373 AJ 129		10-20-44	Card, L. B.	1.0345	5.0	9.65	14.65	S	53,000	
16792 FS 502		6-29-44	Colby, George	1.0311	5.3	8.80	14.16	O	14,000	
17625 AJ 217		12- 7-44	Emerson, George	1.0330	4.8	9.23	14.03	S	15,000	
16793 FS 503		6-29-44	Lang, B. C.	1.0323	5.5	9.20	14.70	S	202,000	
16784 FS 494		6-29-44	Rowe, C. K.	1.0317	5.3	9.01	14.31	S	19,000	
17371 AJ 127		10-20-44	Rowe, C. K.	1.0312	4.8	8.77	13.57	S	37,000	
16780 FS 496		6-29-44	Russell, K. L.	1.0308	5.0	8.71	13.71	O	134,000	
16785 FS 495		6-29-44	Thurlow, J. A.	1.0329	5.3	9.30	14.60	O	49,000	
17372 AJ 128		10-20-44	Thurlow, J. A.	1.0338	5.7	9.52	15.32	O	12,000	
17624 AJ 216		12- 7-44	Thurlow, J. A.	1.0342	5.2	9.61	14.81	O	21,000	
PATTEN										
17558 R 156		11-16-44	Roach, W. E.	1.0321	6.0	9.26	15.26	S	110,000	
17500 R 158		11-16-44	Williger, John	1.0326	4.7	9.14	13.84	U	209,000	
PERRY										
17604 S 239		11-21-44	Adams, Herby	1.0323	5.2	9.16	14.46			No sediment test made. No bacteria count made
17603 S 238		11-21-44	Bishop, Percy	1.0330	5.7	9.42	15.12			No sediment test made. No bacteria count made
17597 S 232		11-21-44	Brooks, Hollis	1.0337	5.6	9.58	15.18			No sediment test made. No bacteria count made
17504 S 229		11-21-44	Curtis, Lee	1.0327	4.3	9.06	13.36			No sediment test made. No bacteria count made
17505 S 230		11-21-44	Dudley, Earl	1.0336	4.0	9.21	13.21			No sediment test made. No bacteria count made
17598 S 233		11-21-44	Green, Herman	1.0309	4.2	8.57	12.77			No sediment test made. No bacteria count made
17601 S 236		11-21-44	Humphries, A. C.	1.0310	4.4	8.04	13.04			No sediment test made. No bacteria count made
17509 S 234		11-21-44	Leach, Russell	1.0330	4.8	9.23	14.03			No sediment test made. No bacteria count made
17600 S 235		11-21-44	McPhall, Crosby	1.0329	4.6	9.16	13.76			No sediment test made. No bacteria count made

Table showing the results of the analyses of samples of raw milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
Perry—Cont.										
17605	S 240	11-21-44	McPhail, Leo	1.0323	5.0	9.10	14.10			No sediment test made
17602	S 237	11-21-44	Smith, John	1.0330	5.4	9.36	14.76			No bacteria count made
17596	S 231	11-21-44	Stanhope, Royden	1.0258	3.7	7.12	10.82			No sediment test made
PERU										
16817	FS 527	6-30-44	Cunningham, Tom	1.0327	5.2	9.24	14.44	O	41,000	No bacteria count made
PHILLIPS										
16880	FS 28	7-13-44	Beal, C. L.	1.0312	4.9	8.79	13.69	S	86,000	No bacteria count made
16995	FS 41	7-29-44	Beal, C. L.	1.0318	4.1	8.78	12.88	O	124,000	No sediment test made
17450	CO 30	10-26-44	Beal, C. L.	1.0324	5.3	9.18	14.48	S	15,000	No bacteria count made
16879	FS 27	7-13-44	Gould, Conrad A.	1.0312	3.3	8.45	11.75	S	12,000	No sediment test made
16996	FS 42	7-29-44	Gould, Conrad A.	1.0309	4.5	8.63	13.13	U	450,000	Below standard in total solids. Added water
PITTSFIELD										
16827	S 1	7-10-44	Collamore, Floyd	1.0315	3.8	8.65	12.45	U	1,524,000	
17385	S 185	10-23-44	Collamore, Floyd	1.0335	4.8	9.36	14.16	U	187,000	
18060	S 354	3- 5-45	Collamore, Floyd	1.0313	4.0	8.64	12.64	U	56,000	
16829	S 3	7-10-44	Turner, H. L.	1.0324	3.6	8.83	12.43	U	122,000	
18061	S 355	3- 5-45	Turner, H. L.	1.0319	3.3	8.05	11.95	S	23,000	
16828	S 2	7-10-44	Wright, H. J.	1.0314	4.6	8.78	13.38	U	702,000	
17384	S 184	10-23-44	Wright, H. J.	1.0325	5.5	9.25	14.75	S	49,000	
18062	S 356	3- 5-45	Wright, H. J.	1.0323	5.1	9.17	14.27	S	370,000	
18063	S 357	3- 5-45	Wright, H. J.	1.0325	4.8	9.11	13.91	O	7,000	
18064	S 358	3- 5-45	Wright, H. J.	1.0350	3.7	9.51	13.21	S	16,000	Sediment test on one-half pint
PLYMOUTH										
18220	R 309	4-11-45	Weymouth, Earl	1.0323	3.4	8.77	12.17	U	44,000	
PRESQUE ISLE										
18212	R 301	4- 6-45	Akeley, Henry C.	1.0318	4.1	8.78	12.88	U	750,000	
18213	R 302	4- 6-45	Akeley, Henry C.	1.0339	4.6	9.42	14.02	U	15,000	
16954	R 14	7-22-44	DeLucry, R. F.	1.0301	4.2	8.38	12.58	S	340,000	
17298	S 145	9-29-44	DeLucry, R. F.	1.0323	4.1	8.91	13.01	U	36,000	
18216	R 305	4- 6-45	DeLucry, R. F.	1.0323	4.0	8.89	12.89	U	351,000	
1-353	R 13	9-29-44	Kempton, Mrs. J. S.	1.0318	4.7	8.90	13.60	S	278,000	
17293	S 143	9-29-44	Kempton, Mrs. J. S.	1.0318	4.4	8.84	13.24	O	680,000	
18215	R 304	4- 6-45	Kempton, Mrs. J. S.	1.0306	4.2	8.50	12.70	S	209,000	
17297	S 144	9-29-44	Mosher, J. P.	1.0314	3.7	8.60	12.30	U	47,000	

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PRINCETON										
984 S 56		7-28-44	Dwelley, John	1.0311	5.6	8.92	14.52	S	84,000	
304 S 151		10- 3-44	Perkins, A. T.	1.0315	4.5	8.79	13.29	C	3,000†	
RANDOLPH										
611 FS 431		5-12-44	Avery, C. E.	1.0320	3.7	8.75	12.45	C	190,000	No bacteria count made
844 H 59		1-26-45	Avery, C. E.	1.0342	5.1	9.59	14.69	U		
609 FS 429		5-12-44	Bailey, Mrs. George	1.0322	4.4	8.95	13.35	S	220,000	
608 FS 428		5-12-44	Cheney, Guy	1.0330	4.6	9.19	13.79	C	8,000	
870 H 76		2- 3-45	Grant & Son, H. P.	1.0335	4.7	9.36	14.06	S	3,000†	
204 FS 142		9- 2-44	Pottle, O. R.	1.0319	3.6	8.70	12.30	S	12,000	No bacteria count made. Below standard in fat and total solids
845 H 60		1-26-45	Pottle, O. R.	1.0303	3.1	8.21	11.31	U		
RANGELEY										
874 FS 22		7-13-44	Ellis, Hal	1.0320	4.1	8.83	12.93	C	624,000	
991 FS 37		7-29-44	Ellis, Linwood	1.0327	3.3	8.85	12.15	C	186,000	
992 FS 38		7-29-44	Ellis, Linwood	1.0309	4.5	8.63	13.13	C	207,000	
451 CO 31		10-26-44	Ellis, Linwood	1.0308	5.0	8.71	13.71	U	158,000	
871 FS 19		7-13-44	Hinckley, Riley	1.0320	4.6	8.94	13.54	C	24,000	
453 CO 33		10-26-44	Hinckley, Riley	1.0337	5.9	9.64	15.54	S	20,000	
875 FS 23		7-13-44	Lamb, Virgil	1.0322	4.0	8.86	12.86	C	93,000	
873 FS 21		7-13-44	Philbrick, Wendell	1.0352	4.1	9.91	14.01	U	54,000	
994 FS 40		7-29-44	Philbrick, Wendell	1.0327	4.7	9.14	13.84	C	124,000	
452 CO 32		10-26-44	Philbrick, Wendell	1.0349	4.6	9.07	14.27	C	18,000	
872 FS 20		7-13-44	Pillsbury, George W.	1.0322	5.0	9.07	14.07	C	69,000	
RICHMOND										
730 FS 475		6-15-44	Curtis, C. P.	1.0323	4.0	8.89	12.89	S	1,150,000	
ROCKLAND										
671 S 310		6-14-44	Aho, Anselm	1.0315	4.3	8.75	13.05	C	98,000	No sediment test made. No bacteria count made
782 S 312		1-24-45	Aho, Anselm	1.0312	4.2	8.65	12.85	S	152,000	
279 S 412		4-27-45	Aho, Anselm	1.0320	4.2	8.85	13.05	C	101,000	
670 S 309		6-14-44	Anderson, Joseph	1.0344	4.2	9.46	13.66	S	124,000	
853 S 337		1-27-45	Anderson, Joseph	1.0334	4.6	9.29	13.89	S	61,000	
275 S 408		4-27-45	Anderson, Joseph	1.0335	4.8	9.36	14.16	C	50,000	
665 S 304		6-13-44	Andrews, N. F.	1.0332	5.4	9.41	14.81	U	64,000	
816 S 332		1-26-45	Andrews, N. F.	1.0332	4.4	9.20	13.60			
999 S 351		2-22-45	Andrews, N. F.	1.0346	5.6	9.80	15.40	U	37,000	
286 S 419		4-27-45	Andrews, N. F.	1.0333	4.6	9.27	13.87	S	98,000	
664 S 303		6-13-44	Aylward, S. B.	1.0332	4.3	9.15	13.48	C	5,000	
789 S 319		1-24-45	Aylward, S. B.	1.0354	4.8	9.84	14.64	S	103,000	
267 S 400		4-25-45	Aylward, S. B.	1.0346	4.7	9.61	14.31	C	4,000	
235 S 418		4-27-45	Bartlett, Russell	1.0333	3.4	9.02	12.42	S	24,000	
668 S 397		6-14-44	Blackington, Charles W.	1.0334	5.1	9.39	14.49	U	360,000	
850 S 334		1-27-45	Blackington, Charles W.	1.0332	4.6	9.24	13.84	S	57,000	
270 S 403		4-27-45	Blackington, Charles W.	1.0337	4.7	9.39	14.09	S	56,000	

Less than.

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Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
Rockland—Cont.										
17852	S 336	1-27-45	Carroll, D. E.	1.0315	4.1	8.71	12.81	U	96,000	
18276	S 409	4-27-45	Carroll, D. E.	1.0325	3.9	8.92	12.82	U	1,000,000†	
16702	S 321	6-15-44	Chaples, Carl W.	1.0342	4.6	9.49	14.09	U	4,000	
17788	S 318	1-24-45	Chaples, Carl W.	1.0344	4.8	9.58	14.38	U	272,000	
18277	S 410	4-27-45	Chaples, Carl W.	1.0327	3.4	8.87	12.27	C	190,000	
16701	S 320	6-15-44	Harjula Bros.	1.0327	4.7	9.14	13.84	C	32,000	
17781	S 311	1-24-45	Harjula Bros.	1.0331	4.6	9.22	13.82	S	12,000	
18272	S 405	4-27-45	Harjula Bros.	1.0315	4.1	8.71	12.81	C	68,000	
18271	S 404	4-27-45	Nichols, B. H.	1.0330	4.8	9.23	14.03	U	150,000	
16672	S 311	6-14-44	Pierce, Alton J.	1.0344	4.3	9.48	13.78	S	43,000	
16675	S 314	6-14-44	Pierce, Alton J.	1.0318	4.3	8.82	13.12	C	14,000	
16676	S 315	6-14-44	Pierce, Alton J.	1.0327	5.1	9.22	14.32	C	42,000	
17790	S 320	1-24-45	Pierce, Alton J.	1.0334	5.0	9.37	14.37	C	16,000	
17791	S 321	1-24-45	Pierce, Alton J.	1.0332	4.4	9.20	13.60	C	87,000	
17856	S 340	1-27-45	Pierce, Alton J.	1.0319	4.5	8.89	13.39	S	1,682,000	
18265	S 398	4-25-45	Pierce, Alton J.	1.0335	4.7	9.34	14.04	U	20,000	
18266	S 399	4-25-45	Pierce, Alton J.	1.0330	4.7	9.21	13.91	S	65,000	
16678	S 317	6-14-44	Piper, F. M.	1.0318	4.3	8.82	13.12	C	12,000	
17854	S 338	1-27-45	Piper, F. M.	1.0334	4.4	9.25	13.65	C	9,000	
18283	S 416	4-27-45	Piper, F. M.	1.0322	4.2	8.90	13.10	C	5,000	
16708	S 222	6-15-44	Ross, Karl B.	1.0327	5.0	9.07	14.20	C	91,000	
17783	S 316	1-24-45	Seekins, Philip R.	1.0321	5.1	9.20	14.17	S	47,000	
16674	S 313	6-14-44	Simmons, L. M.	1.0327	4.9	9.18	14.08	U	420,000	
16700	S 319	6-15-44	Simmons, L. M.	1.0327	5.5	9.30	14.80	C	7,000	
17855	S 339	1-27-45	Simmons, L. M.	1.0320	3.7	8.75	12.45	C	6,000	
17857	S 341	1-27-45	Simmons, L. M.	1.0338	4.4	9.35	13.75	S	20,000	
18273	S 406	4-27-45	Simmons, L. M.	1.0325	4.3	9.01	13.31	S	50,000	
18274	S 407	4-27-45	Simmons, L. M.	1.0305	4.8	8.60	13.40	C	157,000	
18278	S 411	4-27-45	Simmons, L. M.	1.0327	3.9	8.97	12.87	C	3,000†	
16673	S 312	6-14-44	Stinson, Sidney	1.0315	4.7	8.83	13.53	S	165,000	
17998	S 350	2-22-45	Stinson, Sidney	1.0308	4.3	8.57	12.87	C	7,000	
18264	S 397	4-25-45	Stinson, Sidney	1.0316	4.2	8.75	12.95	S	11,000	
ROCKPORT										
17997	S 349	2-22-45	Priest, Fred D.	1.0320	5.1	9.04	14.14	U	10,000	
ROME										
10855	FS 11	7-12-44	Bradley, R. H.	1.0310	4.5	8.66	13.16	C	19,000	
RUMFORD										
16814	FS 524	6-30-44	Austin, V. A.	1.0327	5.3	9.26	14.56	C	134,000	
17565	CO 42	11-16-44	Austin, V. A.	1.0332	5.0	9.32	14.32	S	13,000	
16803	FS 513	6-29-44	Babineau, Clovis	1.0315	3.6	8.61	12.21	S	146,000	
17561	CO 38	11-16-44	Babineau, Clovis	1.0320	4.3	8.88	13.18	U	37,000	
16805	FS 515	6-30-44	Batchelder Bros.	1.0325	5.5	9.00	14.50	S	14,000	
17564	CO 41	11-16-44	Batchelder Bros.	1.0324	4.0	8.91	12.91	C	3,000	
16808	FS 518	6-30-44	Cameron, J. Arthur	1.0315	5.2	8.94	14.14	U	145,000	
17563	CO 40	11-16-44	Cameron, J. Arthur	1.0324	4.8	9.06	13.86	S	27,000	
16807	FS 517	6-30-44	Holt, Fred B.	1.0323	4.2	8.83	13.13	C	186,000	
17562	CO 39	11-16-44	Holt, Fred B.	1.0319	4.4	8.87	13.27	U	31,000	
16804	FS 514	6-30-44	Patrick, Adam	1.0315	4.1	8.71	12.81	C	107,000	

† Less than.

‡ Greater than.

Table showing the results of the analyses of samples of raw milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
Rumford—Cont.										
568	CO 45	11-16-44	Patrick, Adam	1.0331	4.2	9.14	13.34	C	120,000	
518	FS 523	6-30-44	Porter, A. R.	1.0317	4.3	8.80	13.10	C	10,000	
510	FS 520	6-30-44	Roy, E. A.	1.0315	4.2	8.73	12.93	U	40,000	
566	CO 43	11-16-44	Virgin, H. O.	1.0300	3.6	8.23	11.83	C	3,000+	
SABATTUS										
431	FS 70	8-18-44	Atwood, B. J.	1.0317	4.5	8.84	13.34	S	132,000	
432	FS 71	8-18-44	Brule, R. H.	1.0315	4.6	8.81	13.41	S	556,000	
ST. GEORGE										
711	S 330	6-15-44	Frederickson, Albert	1.0339	4.3	9.35	13.65	S	14,000	
708	S 327	6-15-44	Watts, H. S.	1.0318	4.0	8.76	12.76	U	143,000	
709	S 328	6-15-44	Watts, H. S.	1.0327	4.4	9.08	13.48	U	16,000	
710	S 329	6-15-44	Wiley, Rodney	1.0327	5.0	9.20	14.20	C	103,000	
SANFORD										
942	AJ 46	7-21-44	Batchelder, D. W.	1.0313	3.9	8.62	12.52	U	160,000	
945	AJ 49	7-21-44	Briggs, George	1.0323	5.5	9.20	14.70	O	7,000	
943	AJ 47	7-21-44	Carpenter, Lawrence	1.0323	3.8	8.85	12.65	O	97,000	
938	AJ 42	7-21-44	Desrochers, Wilfred	1.0311	4.1	8.61	12.71	S	57,000	
941	AJ 45	7-21-44	Hill, L. E.	1.0332	4.5	9.22	13.72	S	762,000	
944	AJ 48	7-21-44	Hooper, H. M.	1.0313	5.1	8.87	13.97	U	84,000	
940	AJ 44	7-21-44	Morrow, William	1.0320	3.0	8.61	11.61	S	1,270,000	
939	AJ 43	7-21-44	Twombly, G. R.	1.0339	4.0	9.28	13.28	C	5,000	
SANGERVILLE										
940	S 14	7-11-44	McPheters, E. W.	1.0338	5.3	9.53	14.83	C	160,000	
103	S 203	10-24-44	McPheters, E. W.	1.0341	4.4	9.43	13.83	S	20,000	
SCARBORO										
938	AJ 89	8-4-44	Thurston, N. B.	1.0320	3.8	8.77	12.57	S	111,000	
SEARSPORT										
960	S 299	6-13-44	Connor, I. L.	1.0330	4.6	9.19	13.79	S	776,000	
SHERMAN										
550	R 154	11-16-44	Bushey, L. J.	1.0314	3.3	8.52	11.82	U	684,000	
557	R 155	11-16-44	Bushey, L. J.	1.0310	3.7	8.50	12.20	U	420,000	
SHIRLEY MILLS										
999	S 199	10-24-44	Phillips, F. A.	1.0325	4.0	8.94	12.94	S	3,000+	

Less than.

Table showing the results of the analyses of samples of raw milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
SKOWHEGAN										
17213	S 85	9-6-44	Beaulier, Omer	1.0325	4.7	9.09	13.79	C	45,000	
17032	S 257	12-19-44	Beaulier, Omer	1.0387	5.0	9.35	14.35	U	23,000	
17627	S 252	12-19-44	Chase, W. O.	1.0320	3.7	8.75	12.45	C		No bacteria count made
17707	S 298	1-10-45	Chase, W. O.	1.0321	3.9	8.82	12.72	S	9,000	
17215	S 87	9-6-44	Dahlin, J. Russell	1.0315	4.8	8.85	13.65	S	76,000	
17217	S 89	9-6-44	Horne, Walter	1.0296	4.2	8.25	12.45	S	1,714,000	
17628	S 253	12-19-44	Horne, Walter	1.0330	5.0	9.27	14.27	U		No bacteria count made
17706	S 297	1-10-45	Horne, Walter	1.0332	4.6	9.24	13.84	U	10,000	
17219	S 91	9-6-44	Laney, A. E.	1.0325	5.0	9.15	14.15	C	13,000	
17029	S 254	12-19-44	Laney, A. E.	1.0328	5.3	9.28	14.58	S	17,000	
17218	S 90	9-6-44	Laney, J. J.	1.0325	4.2	8.98	13.18	S	174,000	
17630	S 255	12-19-44	Laney, J. J.	1.0325	4.4	9.03	13.43	C	376,000	
17216	S 88	9-6-44	Mathers, E. C.	1.0335	5.7	9.55	15.25	U	8,000	
17633	S 258	12-19-44	Mathers, E. C.	1.0343	3.9	9.38	13.28	C	70,000	
17214	S 86	9-6-44	Newton, A. C.	1.0332	4.6	9.24	13.84	C	66,000	
17631	S 256	12-19-44	Newton, A. C.	1.0328	5.1	9.24	14.34	S	71,000	
17221	S 93	9-6-44	Smith's Jersey Farm	1.0327	4.7	9.14	13.84	S	1,524,000	
17626	S 251	12-19-44	Smith's Jersey Farm	1.0335	3.8	9.15	12.95	U		No bacteria count made
SMITHFIELD										
16854	FS 10	7-12-44	Hartford, Luther	1.0320	4.9	9.00	13.90	S	80,000	
16853	FS 9	7-12-44	Richardson, Leon	1.0320	5.4	9.10	14.50	C	53,000	
SOLOH										
17051	S 204	12-21-44	Davis, T. F.	1.0325	4.3	9.01	13.31	S	9,000	
STONINGTON										
17609	S 244	11-30-44	Barbour, E. H.	1.0311	4.9	8.77	13.67	C	88,000	
17608	S 243	11-30-44	Barbour, H. M.	1.0315	4.6	8.81	13.41	C	86,000	
17607	S 242	11-30-44	Knowlton, Ralph	1.0325	5.3	9.21	14.51	U	11,000	
STRATTON										
16870	FS 18	7-13-44	Butts, John A.	1.0329	5.0	9.24	14.24	S	67,000	
17454	CO 34	10-26-44	Butts, John A.	1.0315	3.9	8.67	12.57	S	53,000	
STRONG										
16882	FS 30	7-13-44	Stevens, John	1.0323	3.6	8.81	12.41	C	11,000	
16998	FS 44	7-29-44	Stevens, John	1.0332	3.9	9.09	12.99	C	142,000	
17449	CO 29	10-26-44	Stevens, John	1.0317	5.0	8.94	13.94	S	15,000	
16881	FS 29	7-13-44	Worthley, N. H.	1.0283	3.9	8.10	12.00	S	147,000	Added water
16997	FS 43	7-29-44	Worthley, N. H.	1.0311	4.4	8.67	13.07	S	109,000	
16990	FS 45	7-29-44	Worthley, N. H.	1.0313	4.4	8.72	13.12	S	112,000	
17448	CO 28	10-26-44	Worthley, N. H.	1.0260	4.4	7.24	11.64		11,000	No sediment test made. Below standard in solids. Added water.

Table showing the results of the analyses of samples of raw milk

Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
SOUTHWEST HARBOR									
32 S 293	5-25-44	Blanchard, M. D.	1.0313	4.6	8.76	13.36	C	3,000†	
29 S 290	5-25-44	Carter, Robert	1.0310	6.9	9.27	16.17	C	3,000†	
30 S 291	5-25-44	Herrick, W. E.	1.0315	4.7	8.83	13.53	C	5,000	Sediment test on one-half pint
THOMASTON									
04 S 323	6-15-44	Bucklin, W. E.	1.0325	4.6	9.07	13.67	S	96,000	
84 S 314	1-24-45	Bucklin, W. E.	1.0331	4.6	9.22	13.82		19,000	No sediment test made
82 S 415	4-27-45	Bucklin, W. E.	1.0317	4.5	8.84	13.34	S	7,000	
06 S 325	6-15-44	Horsley, Ernest	1.0344	5.3	9.68	14.98	C	67,000	
79 S 318	6-14-44	Seekins, Philip	1.0336	4.3	9.28	13.58	S	67,000	
07 S 326	6-15-44	Watts, R. F.	1.0327	5.5	9.30	14.80	C	39,000	
85 S 315	1-24-45	Watts, R. F.	1.0329	5.3	9.31	14.61		118,000	No sediment test made
80 S 413	4-27-45	Watts, R. F.	1.0332	4.5	9.22	13.72	S	292,000	
05 S 324	6-15-44	Wyllie, R. S.	1.0332	5.5	9.43	14.93	U	7,000	
87 S 317	1-24-45	Wyllie, R. S.	1.0330	4.3	9.13	13.43	U	22,000	
81 S 414	4-27-45	Wyllie, R. S.	1.0323	4.2	8.93	13.13	U	10,000	
TOPSHAM									
18 FS 463	6-15-44	Luce, M. A.	1.0315	4.0	8.69	12.69	C	426,000	
21 H 104	2-9-45	Luce, M. A.	1.0328	5.3	9.28	14.58	C	76,000	
03 H 194	3-15-45	Luce, M. A.	1.0339	4.7	9.44	14.14	S	674,000	
19 H 210	3-28-45	Luce, M. A.	1.0314	4.3	8.72	13.02	U	502,000	
25 FS 470	6-15-44	St. Laurent, Thomas	1.0325	3.2	8.78	11.98	U	10,000	Below standard in fat
17 H 100	2-9-45	St. Laurent, Thomas	1.0323	3.7	8.83	12.53	U	4,000	
28 H 182	2-23-45	St. Laurent, Thomas	1.0320	3.5	8.71	12.21	U	8,000	
19 FS 464	6-15-44	Todd, F. H.	1.0315	5.0	8.89	13.89	S	500,000	
TURNER									
37 H 146	2-15-45	Hathaway, B. W.	1.0323	4.7	9.04	13.74	S	116,000	
UNITY									
01 S 385	3-15-45	Chase & Son, E. D.	1.0334	3.6	9.08	12.68	U	688,000	
00 S 384	3-15-45	Elwell, Robert C.	1.0334	6.6	9.81	16.41	S	14,000	
WARREN									
36 S 305	6-14-44	Hills, V. E.	1.0336	4.1	9.23	13.33	C	5,000	
37 S 306	6-14-44	Hills, V. E.	1.0344	4.2	9.40	13.66	C	110,000	
33 S 313	1-24-45	Hills, V. E.	1.0339	5.0	9.50	14.50	S	12,000	
49 S 333	1-27-45	Hills, V. E.	1.0320	4.8	8.98	13.78	C	20,000	
WATERVILLE									
39 S 282	1-3-45	Balmut, Thomas	1.0322	4.1	8.88	12.98	U	15,000	
40 S 301	1-10-45	Black, Edgar	1.0225	3.6	5.96	9.56		70,000	No sediment test made. Below standard in total solids. Added water

less than.

Table showing the results of the analyses of samples of raw milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
Waterville—Cont.										
17955	S 342	2-14-45	Black, Edgar	1.0244	3.4	6.58	9.98			No sediment test made No bacteria count made Below standard in total solids. Added water
17709	S 300	1-10-45	Brackett, C. M.	1.0340	4.8	9.48	14.28	U	8,000	Sediment test on one-half pint
17252	S 124	9-13-44	Clement, Frank	1.0320	4.6	8.94	13.54	C	11,000	
17672	S 285	1-3-45	Clement, Frank	1.0317	4.6	8.86	13.46	C	38,000	
17291	S 138	9-21-44	Crummett & Sons, C. H.	1.0300	4.5	8.41	12.91	C	307,000	
17249	S 121	9-13-44	Curtis, Victor	1.0299	5.6	8.61	14.21	U	31,000	
17671	S 284	1-3-45	Curtis, Victor	1.0330	4.3	9.13	13.43	S	45,000	
17711	S 302	1-10-45	Estabrook, Preston	1.0311	3.8	8.55	12.35	C	25,000	Sediment test on one-half pint
17712	S 303	1-10-45	Estabrook, Preston	1.0316	3.8	8.67	12.47	C	22,000	Sediment test on one-half pint
17290	S 137	9-21-44	Fitzpatrick, H. B.	1.0320	4.7	8.96	13.66	C	80,000	
17692	S 293	1-4-45	Fitzpatrick, H. B.	1.0323	4.2	8.93	13.13	S	12,000	
17245	S 117	9-12-44	Gagnon & Son, George	1.0320	4.4	8.90	13.30	S	4,000	Sediment test on one-half pint
17246	S 118	9-12-44	Gagnon & Son, George	1.0310	5.2	9.06	14.26	C	80,000	Sediment test on one-half pint
17247	S 119	9-12-44	Gagnon & Son, George	1.0320	5.0	9.02	14.02	S	9,000	Sediment test on one-half pint
17675	S 288	1-3-45	Gagnon & Son, George	1.0327	5.0	9.20	14.20	S	9,000	
17714	S 305	1-10-45	Gifford, G. E.	1.0322	4.9	9.05	13.95	C	49,000	Sediment test on one-half pint
17659	S 272	12-21-44	Hallee, Oscar	1.0320	3.9	8.79	12.69	C	36,000	
17238	S 110	9-12-44	Holmes, Carroll	1.0335	3.5	9.09	12.59	S	119,000	
17661	S 274	12-21-44	Holmes, Carroll	1.0312	4.2	8.65	12.85	U	4,086,000	
17658	S 345	2-14-45	Holmes, Carroll	1.0310	4.0	8.56	12.56	S	217,000	
17243	S 115	9-12-44	Jackson & Son, G. B.	1.0323	4.7	9.04	13.74	U	7,000	
17606	S 279	12-21-44	Jackson & Son, G. B.	1.0326	5.1	9.10	14.29	U	13,000	
17295	S 142	9-21-44	Norton, H. T.	1.0323	4.2	8.93	13.13	S	346,000	
17254	S 126	9-13-44	Pellerin & Son, A.	1.0320	4.4	8.90	13.30	S	52,000	
17694	S 295	1-4-45	Pellerin & Son, A.	1.0314	3.6	8.58	12.18	S	13,000	
17248	S 120	9-13-44	Reny, Oscar	1.0311	4.2	8.63	12.83	C	432,000	
17691	S 292	1-4-45	Reny, Oscar	1.0339	4.8	9.45	14.25	S	1,252,000	
17288	S 135	9-21-44	Richardson & Son, Roy	1.0320	4.0	8.81	12.81	S	1,206,000	
17241	S 113	9-12-44	Rossignol, D.	1.0332	3.5	9.01	12.51	C	54,000	
17663	S 276	12-21-44	Rossignol, D.	1.0207	3.6	5.76	9.36		30,000	No sediment test made Below standard in total solids. Added water
17708	S 299	1-10-45	Rossignol, D.	1.0344	4.0	9.42	13.42	C	142,000	
17957	S 344	2-14-45	Rossignol, D.	1.0316	4.0	8.71	12.71	C	59,000	
17250	S 122	9-13-44	Rossignol, L.	1.0310	4.0	8.56	12.56	S	1,587,000	
17251	S 123	9-13-44	Rossignol, L.	1.0310	4.0	8.78	12.78	S	104,000	
17667	S 283	12-21-44	Rossignol, L.	1.0321	4.4	8.93	13.33	C	36,000	
17668	S 281	12-21-44	Rossignol, L.	1.0329	4.6	9.16	13.76	S	30,000	
17673	S 286	1-3-45	Rossignol, L.	1.0315	4.4	8.77	13.17	C	42,000	
17242	S 114	9-12-44	Shores, C. H.	1.0303	4.5	8.49	12.99	C	3,000†	
17674	S 287	1-3-45	Shores, C. H.	1.0327	4.7	9.14	13.84	S	600,000	
17956	S 343	2-14-45	Shores, C. H.	1.0320	5.3	9.08	14.38	C	7,000	
17253	S 125	9-13-44	Slivski & Son, F.	1.0331	4.1	9.11	13.21	U	190,000	
17693	S 294	1-4-45	Slivski & Son, F.	1.0342	4.1	9.39	13.49	S	11,000	
17237	S 109	9-12-44	Smiley, M. P.	1.0327	4.0	8.99	12.99	S	125,000	
17670	S 283	1-3-45	Smiley, M. P.	1.0315	5.4	8.98	14.38	C	16,000	

† Less than.

Table showing the results of the analyses of samples of raw milk

Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
Waterville—Cont.									
89 S 290	1-4-45	Smith, A. L.	1.0331	5.0	9.30	14.30	U	182,000	
90 S 291	1-4-45	Smith, A. L.	1.0339	3.4	9.17	12.57	S	486,000	
13 S 304	1-10-45	Stansfield, Mrs. J.	1.0330	3.5	8.96	12.46	S	104,000	
14 S 116	9-12-44	Stetson, Arthur	1.0313	3.8	8.60	12.40	S	312,000	
30 S 273	12-21-44	Stetson, Arthur	1.0317	3.7	8.68	12.38	S	13,000	
87 S 134	9-21-44	Webber, Fred	1.0323	3.5	8.79	12.29	U	2,984,000	
94 S 141	9-21-44	Webber, G. F. & M. G.	1.0323	4.1	8.91	13.01	U	326,000	
58 S 271	12-21-44	Webber, G. F. & M. G.	1.0325	3.9	8.92	12.82	U	139,000	
93 S 140	9-21-44	Wyman & Son, F. W.	1.0313	4.6	8.76	13.36	C	268,000	
WELD									
77 FS 25	7-13-44	Conant, O. E.	1.0332	3.9	9.09	12.99	C	204,000	
78 FS 26	7-13-44	Sanborn, Oscar	1.0313	4.8	8.80	13.60	U	250,000	
WELLS									
36 AJ 87	8-4-44	Davis, Frank	1.0327	4.5	9.10	13.60	S	29,000	
35 AJ 86	8-4-44	Goodwin, L. F.	1.0318	4.6	8.88	13.48	U	95,000	
16 AJ 67	8-4-44	Littlefield, A. W.	1.0319	4.3	8.84	13.14	U	220,000	
15 AJ 66	8-4-44	Lord, George	1.0309	4.7	8.67	13.37	U	157,000	
34 AJ 85	8-4-44	Perkins, Joel	1.0324	4.0	8.91	12.91	U	335,000	
17 AJ 68	8-4-44	Ridley, Howard	1.0320	3.5	8.71	12.21	S	150,000	
WESTBROOK									
51 AJ 251	6-7-44	Begin & Son, F. X.	1.0311	4.8	8.75	13.55	S	168,000	
57 AJ 258	6-7-44	Bogdahn, J. P.	1.0325	4.3	9.01	13.31	U	40,000	
55 AJ 256	6-7-44	Christie, Philip	1.0323	5.7	9.25	14.95	C	11,000	
47 AJ 247	6-7-44	Clarke, William	1.0323	4.5	9.00	13.50	S	72,000	
53 AJ 254	6-7-44	Libby, R. F.	1.0323	3.9	8.62	12.52	U	452,000	
52 AJ 253	6-7-44	Smith, G. A.	1.0311	4.8	8.75	13.55	C	7,000	
54 AJ 255	6-7-44	Thompson & Son, H.	1.0313	4.0	8.76	13.36	C	548,000	
WINTER HARBOR									
00 S 83	8-10-44	Bunker, Percy	1.0320	4.3	8.88	13.18	S	12,000	
31 S 178	10-4-44	Bunker, Percy	1.0325	6.0	9.36	15.36	S	3,000†	
32 S 179	10-4-44	Williams, Chester	1.0325	5.8	9.32	15.12	S	14,000	
WINTERPORT									
58 R 92	10-26-44	Bowley & Sons, C. W.	1.0312	4.7	8.75	13.45	S	200,000	
33 R 189	1-12-45	Bowley & Sons, C. W.	1.0316	4.0	8.71	12.71	U	1,016,000	
31 R 95	10-26-44	Colson, A. J.	1.0275	4.6	7.81	12.41	C	102,000	
35 R 191	1-12-45	Colson, A. J.	1.0291	4.7	8.23	12.93	U	8,000	
30 R 94	10-26-44	Dunton, F. E.	1.0300	4.8	8.47	13.27	S	8,935,000	
59 R 93	10-26-44	Littlefield, Lewis	1.0318	4.8	8.92	13.72	U	91,000	
34 R 190	1-12-45	Littlefield, Lewis	1.0320	4.5	8.92	13.42	U	143,000	

less than.

Table showing the results of the analyses of samples of raw milk

Station number	Inspector's number	Date received	Location and name of dealer	Specific Gravity	Butterfat	Solids-not-fat	Total Solids	Sediment*	Plate Count—Colonies per c.c.	Remarks
WINTHROP										
17163	FS 102	8-19-44	Horzempa, William	1.0339	4.7	9.43	14.13	S	13,000	
17162	FS 101	8-19-44	Slonina, Jan	1.0308	4.3	8.57	12.87	S	62,000	
17164	FS 103	8-19-44	Whiting & Hewitt	1.0329	3.7	8.97	12.67	C	16,000	
WISCASSET										
16696	FS 453	6-14-44	Colby, Horace	1.0327	5.0	9.20	14.20	S	79,000	
16695	FS 452	6-14-44	Johnson, Forest	1.0320	5.4	9.10	14.50	C	28,000	
16699	FS 456	6-14-44	Keene, Ralph	1.0336	5.0	9.42	14.42	C	842,000	
WOODLAND										
16983	S 55	7-28-44	Brown, Clyde	1.0305	4.7	8.58	13.28	U	1,143,000	
17303	S 150	10- 3-44	Brown, Clyde	1.0319	4.6	9.27	13.87	C	32,000	
16982	S 54	7-28-44	Jamieson, A. J.	1.0323	2.8	8.65	11.45	U	130,000	Below standard in fat and total solids
17300	S 147	10- 3-44	Jamieson, A. J.	1.0305	4.6	8.56	13.16	S	105,000	
16980	S 52	7-28-44	Scribner, Leon	1.0313	4.7	8.78	13.48	S	762,000	
17302	S 149	10- 3-44	Varnum, Earl	1.0313	3.8	8.60	12.40	S	3,000†	
WOODSTOCK										
16796	FS 506	6-29-44	Bean, Frank	1.0346	3.3	9.33	12.63	C	83,000	
16795	FS 505	6-29-44	Robbins, Ernie	1.0313	4.4	8.72	13.12	C	7,000	
YARMOUTH										
18113	H 204	3-28-45	Beckwith, Merle	1.0306	5.0	8.66	13.66	U	172,000	
18114	H 205	3-28-45	Hilton, F. L.	1.0314	3.8	9.62	13.42	S	4,000	
18093	H 184	3-15-45	Vincent, Hadden	1.0320	5.1	9.04	14.14	C	202,000	
YORK										
17033	AJ 84	8- 4-44	Duval, Robert	1.0324	4.8	9.08	13.88	C	9,000	
17031	AJ 82	8- 4-44	Moulton, Arnold H.	1.0297	3.7	8.17	11.88	S	57,000	
17032	AJ 83	8- 4-44	Norton, Roger R.	1.0288	5.0	8.21	13.21	U	252,000	
17029	AJ 80	8- 4-44	Plaisted, A. K.	1.0324	4.3	8.98	13.28	S	87,000	

† Less than.

Table showing the results of the analyses of samples of cream

Station number	Inspector's number	Date received	Location and name of dealer	Grade purchased by the inspector	Butterfat	Plate Count—Colonies per c.c.	Remarks	
AUGUSTA								
17858	H 64	1-27-45	Bean, Harold T.	* Heavy*	20.0	17,000	No bacteria count made. Below standard in fat	
17822	H 37	1-26-45	Benner, George L.		20.5	220,000		
17946	H 129	2-14-45	Benner, George L.		19.5	128,000		
16584	FS 404	5-10-44	Busque, Rudolph		37.0	952,000		
16583	FS 403	5-10-44	Cunningham, Fred		21.0	287,000		
17825	H 40	1-26-45	Cunningham, Fred		24.5	486,000		
17942	H 125	2-12-45	Drew's Dairy		15.0			
18170	H 267	3-31-45	Drew's Dairy		18.0	79,000		
17824	H 39	1-26-45	Foster, Russell		36.0	31,000		
BANGOR and BREWER								
18044	R 232	3- 1-45	Edmunds, Arthur J.	§	24.0	30,000	No bacteria count made	
16760	R 278	6-28-44	Footman's Dairy	Light	18.5	21,000		
17258	R 55	9-13-44	Footman's Dairy	Light	18.5			
17506	R 116	10-31-44	Footman's Dairy	Light	19.5	390,000		
17905	R 226	2- 7-45	Footman's Dairy	Light	20.5	1,000,000†		
17903	R 227	2- 7-45	Footman's Dairy	Heavy	37.0	1,000,000†		
16765	R 283	6-28-44	Grant's Dairy	Light	18.5	4,445,000		
17909	R 230	2- 7-45	Grant's Dairy	Heavy	39.0	305,000		
16779	R 297	6-28-44	Jones, Austin		21.0	1,778,000		
16774	R 292	6-28-44	Kenduskeag Valley Co-op. Creamery	Light	23.5	4,508,000		
BAR HARBOR								
17794	R 195	1-25-45	Mt. Desert Island Dairies, Inc.	Light	18.5	3,000†		
16554	R 235	5- 5-44	Whitney, H. C.		18.0	90,000		
BELFAST								
18259	S 392	4-20-45	Keene, F. H.	Light	18.0	1,000,000†	Below standard in fat	
18257	S 390	4-20-45	Round Top Farms	Light	18.0	1,000,000†		
BRUNSWICK								
18027	H 181	2-23-45	Granite Farm Dairy	Light	23.5	1,411,000		
16727	FS 472	6-15-44	Merriman, A.		20.5	4,000		
CAMDEN								
17809	S 325	1-26-45	Nash & Son, H. H.	Light	17.5	950,000	Below standard in fat	
FORT FAIRFIELD								
17061	R 41	8- 9-44	Murphy, Henry	°	28.5	141,000		

* Cap labeled Light; §Cap labeled Cream °Cap labeled Milk.

† Greater than.

‡ Less than.

Table showing the results of the analyses of samples of cream

Station number	Inspector's number	Date received	Location and name of dealer	Grade purchased by the inspector	Butterfat	Plate Count—Colonies per c.c.	Remarks
FREEPORT							
18098	H 189	3-15-45	Melanson, A. H.	* 20	33.0	8,000	Below standard in fat
18099	H 190	3-15-45	Noble, H. G.		44.5	10,000	
18096	H 187	3-15-45	Shaw, John		15.5	86,000	
GARDINER							
18193	H 274	4- 5-45	Gosline, A. N.	*	25.0	4,445,000	
HALLOWELL							
16606	FS 426	5-12-44	MacHardy, Dinsmore R.	* 20	23.5	19,000	
17199	FS 137	9- 1-44	MacHardy, Dinsmore R.		25.5	80,000	
17837	H 52	1-26-45	MacHardy, Dinsmore R.		24.0	4,000	
17835	H 50	1-26-45	Parker, Millard		21.0	7,000	
HOULTON							
17041	R 21	8- 8-44	Turney, Ernest	* 20	20.0	6,000	
18181	R 282	4- 3-45	Turney, Ernest		20.5	67,000	
HOWLAND							
17525	R 123	11- 8-44	Emery, Ralph	Heavy	40.5	84,000	
LISBON FALLS							
17888	H 89	2- 7-45	Tarr, W. S.	*	33.0		No bacteria count made
MARS HILL							
17058	R 38	8- 9-44	Bradstreet, Mrs. Hanford	* 20	31.5	8,634,000	
17055	R 35	8- 9-44	Bryant, Vernon		28.5	188,000	
MILO							
16861	S 21	7-12-44	Downs, William	* Light	21.0	1,579,000	Below standard in fat
18082	S 376	3- 7-45	Downs, William		16.0	98,000	
MONSON							
17420	S 207	10-25-44	Forbus, Max C.		24.0	340,000	
NORWAY							
16789	FS 499	6-29-44	Thurston, Alton	* 20	18.0	1,012,000	Below standard in fat
17354	AJ 110	10-18-44	Thurston, Alton		20.0	17,000	
17346	AJ 102	10-18-44	Walker, W. H.		16.0	13,000	

Table showing the results of the analyses of samples of cream

Station number	Inspector's number	Date received	Location and name of dealer	Grade purchased by the inspector	Butterfat	Plate Count—Colonies per c.c.	Remarks
Norway—Cont.							
16787	FS 497	6-29-44	Whitman & Son, L. C.	*	23.5	3,000†	
17355	AJ 111	10-18-44	Whitman & Son, L. C.	*	20.5	3,000†	
PATTEN							
17559	R 157	11-16-44	Katahdin Creamery Co.	Light*	17.5		No bacteria count made. Below standard in fat
SACO							
17099	AJ 99	8-10-44	Fenderson, G. H.	Light	19.0	40,000	
17480	AJ 175	10-27-44	Fenderson, G. H.	Light	20.0	5,000	
17444	AJ 160	10-26-44	Pothier & Son, John	Medium	24.0	35,000	
SOUTH PORTLAND							
17492	AJ 187	10-28-44	Dean, Charles R.	Light	21.5	396,000	
SOUTHWEST HARBOR							
16618	S 280	5-24-44	Clark, Owen J., Jr.	Light‡	14.5	1,466,000	Below standard in fat
17070	S 68	8- 9-44	Clark, Owen J., Jr.	Light	17.5	1,397,000	Below standard in fat
TOPSHAM							
16720	FS 465	6-15-44	Todd, F. H.	Light	31.5	500,000	
17920	H 103	2- 9-45	Todd, F. H.	‡	23.5	1,000,000†	

† Less than.

‡ Greater than.

HAMBURG STEAK

Twenty-four samples of Hamburg steak were collected and submitted for analysis which included bacteriological examination. The percentages of water and fat were determined and each sample was analyzed for the possible presence of sulfites. The number of bacteria per gram at 37° C. was determined by grinding a 10-gram sample with 10 grams of sterile sand and 99 ml. of sterile water by means of a sterile, porcelain mortar and pestle. The standard plate count was made from plates with dilutions of 1 to 1,000 and 1 to 10,000 on standard tryptone-glucose-extract agar. Coliform organisms were determined from plates with 1 to 10 dilutions, using violet red bile agar. Although there are no official standards for the bacterial content in Hamburg steak, prompt refrigeration and storage of the product under sanitary conditions from the time of the slaughter of the animal to the time of delivery of the ground meat to the customer should give on the Hamburg steak a standard plate count not greater than 500,000 bacteria per gram and coliform organisms not greater than 400 per gram.

Through the courtesy of the Maine State Office of Price Administration we quote the definition of ground beef as it appears in Revised MPR 169—Beef and Veal Carcasses and Wholesale Cuts. This definition is as follows: "‘Ground beef’ (hamburger, hamburger steak, hamburger steak) means ground, chopped or comminuted fresh beef derived from the skeletal portions of the dressed carcass (but not including head meat), which contains no offal, added blood, cartilage, gristle, bone, cereal product or other ingredient except seasoning, and which does not have a fat content in excess of 28 per cent by chemical analysis. Ground beef shall be ground at least twice, the final grinding through a plate with holes not more than three-sixteenths of an inch in diameter, or chopped in a rotary cutter, or by other means giving equivalent results."

The results of analyses show that no sulfite was added as a preservative. Three samples were above 28 per cent in fat content. Thirteen samples exceeded 500,000 bacteria per gram and six samples exceeded 400 colon organisms per gram.

Table showing the results of the analyses of samples of
Hamburg steak

Station number	Dealer and town	Manufacturer or wholesaler	Water %	Fat %	Sulfite	Standard plate count bacteria per gram	Colon organisms per gram
33691	Bean Bros., Biddeford	Own make	66.75	10.98	None	830,000	290
33685	Biddeford Beef Co., Biddeford	—	69.79	7.99	None	50,000	1060
33683	Bourgoin Market, Patrick J. Biddeford	—	53.20	23.83	None	8,800,000	60
33709	Charles Market, Portland	—	55.35	22.30	None	160,000	60
33708	Collins Market, Portland	—	68.36	7.87	None	1,400,000	0
33706	Cooperative Market, Cumberland Mills	—	60.54	15.64	None	50,000	20
33693	Edward's Super Market, Biddeford	Own make	48.49	30.54	None	9,600,000	0
33688	First National Store, Saco	—	52.00	24.34	None	680,000	1300
33705	First National Store Super Market, Westbrook	—	54.10	24.73	None	600,000	860
33689	Fortin Market, Landry E., Biddeford	Own make	49.91	24.89	None	30,000	80
33687	Glenwood Grocery, Portland	—	60.00	18.77	None	20,000	10
33707	LaPointe's Market, A. D., Westbrook	—	64.69	9.88	None	6,700,000	40
33710	Leo's Market, Portland	—	72.33	4.43	None	300,000	30
33704	Mathieu Mkt., Albert, Cumberland Mills	—	67.35	8.76	None	160,000	120
33713	Mellen St. Market, Portland	Own make	58.23	18.78	None	31,700,000	1250
33711	Model Market, Portland	—	59.42	15.98	None	10,000†	470
33715	Naples, F. (Red & White Store) Portland	Own make	30.11	49.65	None	37,100,000	0
33692	Red & White Store, Biddeford	Own make	44.78	30.67	None	23,000,000	20
33694	Rehhard Market, Saco	Own make	59.99	16.95	None	30,000	100
33696	Rosemont Market, Portland	Own make	61.69	15.04	None	3,400,000	1660
33714	Rounds, Inc., C. A., Portland	Own make	61.93	12.64	None	90,000	0
33712	Sclar's Sanitary Market, Portland	Own make	57.77	16.64	None	340,000	10
33690	Silver Fox Food Mart, Biddeford	Own make	61.84	13.46	None	1,180,000	10
33695	Temple Street Cash Market, Saco	Swift & Co., Biddeford	56.47	18.29	None	14,000,000	240

† Less than.

MAPLE SYRUP

Maple syrup is made by the evaporation of maple sap or by the solution of maple syrup. It contains not more than 35 per cent of water. The finished product weighs not less than 11 pounds to the gallon.

The Food, Drug, and Cosmetic Act considers adulterated food products which contain poisonous or deleterious substances except where such substance is required in production or cannot be avoided by good manufacturing practice. In the production of maple products, contamination with lead from certain types of utensils used in the process may occur. Lead is a poisonous substance. In the production of maple products it can be avoided by good manufacturing practice. Therefore, maple syrup and maple sugar are required to be essentially free from lead.

Twelve samples of maple syrup were collected and submitted for analysis. Two were slightly below standard in net weight and three exceeded the standard in water content. Only one sample was found to contain more than two parts per million of lead. A lead content of two to three parts per million may be considered as a substantial amount in maple products.

Table showing the results of the analyses of samples of maple syrup

Station number	Dealer and town	Manufacturer or wholesaler	Pounds per gallon	Water per cent	Sucrose per cent	Ash per cent	Lead number	Lead content parts per million	Grade
34141	Averill, L. A.	Own make	11.09	31.95	65.28	0.52	1.44	0	A
34130	Prentiss	Gerald A. Fournier,	11.18	32.28	65.80	0.53	1.41	0.09	A
34133	Bryant's Market, Bethel	North Troy, Vt.	11.26	30.70	64.29	0.61	1.35	1.32	C
34131	Cobb Brothers, Harmony	Own make	11.01	35.43	63.02	0.56	1.57	3.17	A
34131	Cook, E. L. Strong	Own make	11.09	33.65	63.77	0.72	1.97	0	A
34138	Kitchen & Son, E. M., Dover-Foxcroft	Walla A. Stearns, Burlington, Vt.	11.26	31.90	65.13	0.69	1.86	0.78	B
34134	Mallory Farms, Farmington	Own make	11.26	30.55	66.49	0.58	1.65	0	A
34137	Maple Hill Dairy Farm, Farmington	Own make	10.98	35.12	62.94	0.71	1.78	1.42	A
34132	Sedgeley, M. H. Phillips	Own make	11.09	33.20	63.77	0.61	1.72	0	A
34136	Small, Orlando W., Farmington	Own make	11.18	32.70	64.60	0.72	1.81	0.48	A
34129	Titcomb, H. A., Farmington	Own make	10.93	36.33	60.83	0.80	1.99	0.71	B
34128	Titcomb & Son, M. E., Farmington	Own make	11.26	30.30	66.41	0.53	1.73	0.59	A
34115	Voter, Arthur, Farmington	Own make							

OIL USED IN PACKING SARDINES

A regulation effective July 15, 1938, issued by the Commissioner of Agriculture, states that the oil used in packing sardines shall be a vegetable oil of a grade not below "Prime Winter Yellow Cottonseed Oil." This "Prime Winter Yellow Cottonseed Oil" must be free from water and settlings, sweet in flavor and odor, and of no deeper color than the two combined standard glasses of 35 yellow and 7.6 red on Lovibond's equivalent color scale, and must stand clear, brilliant and limpid for five and one-half hours when tested by the "cold test" as promulgated by the National Cottonseed Products Association, and shall contain not more than 0.10 of 1 per cent free fatty acid, and not in excess of 0.05 per cent dissolved moisture.

Olive oil is the oil obtained from the sound, mature fruit of the olive tree and subjected to the usual refining processes. Peanut oil is the edible oil obtained from the peanut. Soybean oil is the edible oil obtained from the seed of the soybean plant.

One hundred sixty-six samples were received for analysis. It is interesting to note that approximately 73 per cent of the samples of oil received were soybean oil, 10 per cent were peanut oil, 8.5 per cent were cottonseed oil, and 8.5 per cent were olive oil. Based on the number and variety of samples received it is evident that the use of soybean oil in packing sardines has increased considerably during the last year.

Two samples of cottonseed oil were of a deeper color than the two combined standard glasses of 35 yellow and 7.6 red on Lovibond's equivalent color scale. By the cold test, one sample of olive oil was "very slightly cloudy," two samples of olive oil were "slightly cloudy," and one sample of soybean oil was "very cloudy." Peanut oil, due to the presence of a natural constituent, clouds in the cold test.

Table showing the results of the analyses of samples of oil used in packing sardines

Station number	Sample	Dealer and town	Manufacturer or wholesaler	Refractive index at 25° C.	Iodine number (Hanus)	Free fatty acids per cent	Cold Test	Color*
33716	1 Conti Superfine 100% Pure Olive Oil	Addison Packing Co., Southwest Harbor	N. S. Wilson & Sons, Boston, Mass.	1.4699	84.5	1.02	Clear	†
33766	Refined Soybean Oil	Addison Packing Co., Southwest Harbor	Armstrong Packing Co., Newark, N. J.			0.021	Clear	10 y 1.2 r
33798	Soya Bean Oil	Addison Packing Co., Southwest Harbor	Spencer Kellogg & Sons, Inc., Boston, Mass.			0.028	Clear	10 y 1.0 r
33833	Winterized Soya Bean Oil	Addison Packing Co., Southwest Harbor	E. F. Drew & Co., Inc., New York 10, N. Y.			0.035	Clear	10 y 1.6 r
33886	Soya Bean Oil	Addison Packing Co., Southwest Harbor	E. F. Drew & Co., Inc., Boonton, N. J.			0.035	Clear	35 y 1.3 r
33887	Soya Bean Oil	Addison Packing Co., Southwest Harbor	Spencer Kellogg & Sons, Inc., Edgewater, N. J.			0.028	Clear	10 y 1.3 r
33897	Armstrong Packing Co. Soya Bean Oil	American Sardine Corp., Machiasport	George W. King, Newark, N. J.			0.028	Clear	10 y 1.2 r
33812	Soya Bean Oil Refined	American Sardine Corp., Machiasport	Armstrong Packing Co., Fort Newark, N. J.			0.028	Clear	35 y 1.7 r
33854	Aurora Brand Refined Edible Soy Bean Oil	American Sardine Corp., Machiasport	E. F. Drew & Co., Inc., New York 10, N. Y.			0.021	Clear	10 y 1.2 r
33908	Soy Bean Oil	American Sardine Corp., Machiasport	H. T. Drew & Co., Inc., Boonton, N. J.			0.021	Clear	35 y 2.3 r
33961	Aurora Brand Refined Winterized Edible Soya Bean Oil	American Sardine Corp., Machiasport	E. F. Drew & Co., Inc., Boonton, N. J.			0.028	Clear	35 y 0.8 r
34098	Spensoy Soybean Oil	American Sardine Corp., Machiasport	Spencer Kellogg & Sons, Inc., Edgewater, N. J.	1.4728	134	0.028	Clear	10 y 1.0 r
33859	Staley's Edsoy Oil	Belfast Packing Co., Belfast	A. E. Staley Mfg. Co., Decatur, Ill.			0.021	Clear	35 y 1.0 r
34117	Daisy-Soya Bean Oil	Belfast Packing Co., Belfast	Lookout Oil & Refining Co., Chattanooga, Tenn.	1.4725	133	0.035		10 y 1.6 r
34118	1, 2, Olive Oil	Belfast Packing Co., Belfast	Lafayette Packing Co., Rockland, Me.	1.4672	82	1.21	Clear	†

* y = yellow

r = red

1 Halphen test for cottonseed oil = negative, Station No. 33716; negative, Station No. 34118; negative, Station No. 34100.

2 Rellier test for peanut oil = negative, Station No. 34118; negative, Station No. 34100.

† Color undetermined.

Table showing the results of the analyses of samples of oil used in packing sardines

Station number	Sample	Dealer and town	Manufacturer or wholesaler	Refractive index at 25° C.	Iodine number (Hanus)	Free fatty acids per cent	Cold Test	Color*
34160	1, 2, Pure Spanish Olive Oil	Belfast Packing Co., Belfast	Commercial Complex Co., New York, N. Y.	1.4673	87	0.21	Clear	‡
34162	Edible Soy Bean Oil	Belfast Packing Co., Belfast	A. E. Stator, Mfg. Co., Danbury, Conn.	1.4733	123	0.035	Clear	10 y 1.0 †
33904	Aurora Brand Soya Bean Oil	Belfast Packing Co., Belfast	Durkee & Co., Inc., New York 10, N. Y.			0.021	Clear	35 y 1.2 †
34140	Soy Bean Oil	Lubec Fisheries Corp., Lubec	Armstrong Packing Co., Newark, N. J.	1.4729	129	0.023	Clear	10 y 1.6 †
33816	Peanut Oil	Brown Co., The, Portland	American Edible Oil Co., Brooklyn, N. Y.			0.035	Very cloudy	10 y 0.8 †
33818	Durkee's Soya Bean Oil	Brown Co., The, Portland	Durkee Famous Foods, Elmhurst, L. I., N. Y.			0.023	Clear	10 y 1.2 †
33855	Refined Deodorized Peanut Oil	Brown Co., The, Portland	Lookout Oil & Refining Co., Chattanooga, Tenn.			0.023	Very cloudy	10 y 1.3 †
33906	Aurora Brand Refined Winterized Soya Bean Oil	Brawn Co., The, Portland	E. F. Drew & Co., Inc., Boonton, N. J.			0.023	Clear	10 y 1.4 †
33907	* Fremont Trail Pine California Olive Oil	Brawn Co., The, Portland	Commercial Complex Co., New York, N. Y.	1.4679	80.49	2.02	Clear	‡
33941	* Sessions's Brand Pure Peanut Oil for Salads and Cooking	Brawn Co., The, Portland	Desjone Bros., Brooklyn, N. Y.			0.098	Very cloudy	35 y 1.5 †
33908	Deodorized Winterized Soya Bean Oil	Brawn Co., The, Portland	C. F. Simonis & Sons, Inc., Philadelphia, Pa.			0.035	Clear	35 y 1.4 †
33756	Aurora Brand Edible Winter-pressed Soya Bean Oil	Holmes Packing Corp., Eastport	E. F. Drew & Co., Inc., New York 10, N. Y.			0.028	Clear	10 y 1.0 †
33817	Aurora Brand Soya Bean Oil	Holmes Packing Corp., Eastport	E. F. Drew & Co., Inc., New York 10, N. Y.			0.021	Clear	35 y 1.3 †
33912	Oil	Holmes Packing Corp., Eastport	E. F. Drew & Co., Inc., New York 10, N. Y.			0.021	Clear	35 y 1.0 †

* Halphen test for cottonseed oil = negative, Station No. 33907.

‡ Color undetermined.

Table showing the results of the analyses of samples of oil used in packing sardines

Station number	Sample	Dealer and town	Manufacturer or wholesaler	Refractive index at 25° C.	Iodine number (Hanus)	Free fatty acids per cent	Cold Test	Color*
33943	Aurora Brand Refined Edible Soya Bean Oil	Holmes Packing Corp., Eastport	E. F. Drew & Co., Inc., New York 10, N. Y.			0.028	Clear	35 y 1.4 r
33959	Aurora Brand Soya Bean Oil	Holmes Packing Corp., Eastport	E. F. Drew & Co., Inc., New York 10, N. Y.			0.021	Clear	35 y 1.0 r
34003	Aurora Brand Edible Soya Bean Oil	Holmes Packing Corp., Eastport	E. F. Drew & Co., Inc., New York 10, N. Y.			0.028	Clear	10 y 1.0 r
34084	Refined Deodorized Soya Bean Oil	Holmes Packing Corp., Eastport	Armstrong Packing Co., Newark 3, N. J.	1.4730	135	0.035	Clear	10 y 2.0 r
34120	Refined Edible Soya Bean Oil	Holmes Packing Corp., Eastport	E. F. Drew & Co., Inc., Boston, Mass.	1.4729	131	0.042	Clear	10 y 1.2 r
33850	Soya Bean Oil	Jonesport Packing Co., West Jonesport	E. F. Drew & Co., Inc., New York 10, N. Y.			0.028	Clear	35 y 0.9 r
33917	Aurora Brand Refined Edible Soy Bean Oil	Jonesport Packing Co., West Jonesport	E. F. Drew & Co., Inc., Boston, N. J.			0.014	Clear	35 y 1.3 r
34095	Aurora Brand Refined Edible Soybean Oil	Jonesport Packing Co., West Jonesport	E. F. Drew & Co., Inc., Bonton, N. J.			0.035	Clear	10 y 0.7 r
33683	Refined Deodorized Winterized Soybean Oil	Lafayette Packing Co., Rockland	C. F. Simonius & Sons, Inc., Philadelphia, Pa.	1.4730	132	0.040	Clear	10 y 2.1 r
33718	Penola Brand Refined Peanut Oil	Lafayette Packing Co., Rockland	C. F. Simonius & Sons, Inc., Philadelphia, Pa.			0.023	Very cloudy	10 y 2.0 r
33721	Penola Brand Refined Peanut Oil	Lafayette Packing Co., Rockland	C. F. Simonius & Sons, Inc., Philadelphia, Pa.			0.042	Very cloudy	10 y 1.0 r
33722	Durkee Peanut Oil	Lafayette Packing Co., Rockland	Durkee Famous Foods, Elmhurst, L. I., N. Y.			0.028	Very cloudy	10 y 2.6 r
33856	Century Brand Cottonseed Oil	Lafayette Packing Co., Rockland	C. F. Simonius & Sons, Inc., Philadelphia, Pa.			0.071	Clear	35 y 4.7 r
33857	Refined Winterized Soybean Oil	Lafayette Packing Co., Rockland	C. F. Simonius & Sons, Inc., Philadelphia, Pa.			0.064	Clear	35 y 2.0 r
33719	Edible Winterized Soybean Oil	Machiasport Canning Co., Eastport	C. F. Simonius & Sons, Inc., Philadelphia, Pa.			0.042	Clear	10 y 2.0 r

Table showing the results of the analyses of oil used in packing sardines

Station number	Sample	Dealer and town	Manufacturer or wholesaler	Refractive index at 25° C.	Iodine number (Hanus)	Free fatty acids per cent	Cold Test	Color*
33720	Aurora Brand Refined Edible Soyabean Oil	Machiasport Canning Co., Machiasport	E. F. Drew & Co., Inc., New York 10, N. Y.					
33745	Vegetable Oil for Salads—Cottonseed Oil	Machiasport Canning Co., Eastport	Armour & Co., Calais, Me.					
33778	Staley's Edsoy Oil	Machiasport Canning Co., Machiasport	A. E. Staley Mfg. Co., Decatur, Ill.					
33813	Aurora Brand Refined Edible Soya Bean Oil	Machiasport Canning Co., Machiasport	E. F. Drew & Co., Inc., New York 10, N. Y.					
33815	Soya Bean Oil	Machiasport Canning Co., Eastport	E. F. Drew & Co., Inc., New York 10, N. Y.					
33849	Aurora Brand Refined Edible Soya Bean Oil	Machiasport Canning Co., Machiasport	E. F. Drew & Co., Inc., New York 10, N. Y.					
33871	Aurora Brand Refined Edible Soya Bean Oil	Machiasport Canning Co., Eastport	E. F. Drew & Co., Inc., New York 10, N. Y.					
33875	Aurora Brand Refined Edible Winterized Soya Bean Oil	Machiasport Canning Co., Machiasport	E. F. Drew & Co., Inc., New York 10, N. Y.					
33920	Aurora Brand Refined Edible Soya Bean Oil	Machiasport Canning Co., Machiasport	E. F. Drew & Co., Inc., New York 10, N. Y.					
33925	Oil	Machiasport Canning Co., Eastport	E. F. Drew & Co., Inc., New York 10, N. Y.					
33930	Aurora Brand Refined Winterized Edible Soya Bean Oil	Machiasport Canning Co., Eastport	E. F. Drew & Co., Inc., New York 10, N. Y.					
34017	Winterized Soya Bean Oil	Machiasport Canning Co., Eastport	E. F. Drew & Co., Inc., New York 10, N. Y.					
34093	Soya Bean Oil	Machiasport Canning Co., Eastport	E. F. Drew & Co., Inc., New York 10, N. Y.					
34139	Soya Bean Oil	Machiasport Canning Co., Eastport	E. F. Drew & Co., Inc., New York 10, N. Y.	1.4729	135	0.028	Clear	10 y 0.5 r
34144	Refined Edible Winterized Soya Bean Oil	Machiasport Canning Co., Machiasport	E. F. Drew & Co., Inc., New York 10, N. Y.	1.4731	130	0.035	Clear	10 y 1.0 r
				1.4730	131	0.035	Clear	10 y 1.1 r

** Slightly cloudy when received.

Table showing the results of the analyses of samples of oil used in packing sardines

Station number	Sample	Dealer and town	Manufacturer or wholesaler	Refractive index at 25° C.	Iodine number (Hanus)	Free fatty acids per cent	Cold Test	Color*
33746	Winterized Soya Bean Oil	North Lubec Mfg. & Canning Co., North Lubec	Lookout Oil & Refining Co., Chattanooga, Tenn.			0.028	Clear	10 Y 2.3 F
33814	Winterized Soya Bean Oil	North Lubec Mfg. & Canning Co., North Lubec	Armstrong Packing Co., Newark, N. J.			0.042	Clear	35 Y 1.4 F
33845	Soya Bean Oil	North Lubec Mfg. & Canning Co., Rockland	E. F. Drew & Co., Inc., Boonton, N. J.			0.035	Clear	35 Y 2.0 F
33851	Winterized Edible Soya Bean Oil	North Lubec Mfg. & Canning Co., Rockland	E. F. Drew & Co., Inc., Boonton, N. J.			0.028	Clear	35 Y 1.0 F
33882	Aurora Brand Refined Edible Soya Bean Oil	North Lubec Mfg. & Canning Co., North Lubec	Becker & Co., Boonton, N. J.			0.028	Clear	35 Y 0.8 F
33905	Aurora Brand Refined Edible Winterized Soya Bean Oil	North Lubec Mfg. & Canning Co., North Lubec	E. F. Drew & Co., Inc., Boonton, N. J.			0.028	Clear	35 Y 0.4 F
33916	Aurora Brand Edible Soya Bean Oil	North Lubec Mfg. & Canning Co., Rockland	E. F. Drew & Co., Inc., Boonton, N. J.			0.042	Clear	35 Y 1.8 F
33940	Refined Deodorized Soya Bean Oil	North Lubec Mfg. & Canning Co., North Lubec	Armstrong Packing Co., Newark, N. J.			0.014	Clear	35 Y 1.8 F
33958	Winterized Edible Soya Bean Oil	North Lubec Mfg. & Canning Co., Rockland	E. F. Drew & Co., Inc., Boonton, N. J.			0.021	Clear	35 Y 1.0 F
33971	Winterized Soya Bean Oil	North Lubec Mfg. & Canning Co., North Lubec	E. F. Drew & Co., Inc., Boonton, N. J.			0.028	Clear	10 Y 1.0 F
34053	Winterized Soyabean Oil	North Lubec Mfg. & Canning Co., North Lubec	Boonton, N. J.	1.4727	135	0.049	Clear	10 Y 1.3 F
34094	Winter Pressed Soy Bean Oil	North Lubec Mfg. & Canning Co., North Lubec	Spencer Kellogg & Sons, Inc., Edgewater, N. J.	1.4731	135	0.028	Clear	10 Y 1.2 F
33777	Soybean Oil	Peacock Canning Co., R. J., Lubec	E. F. Drew & Co., Inc., New York 10, N. Y.			0.028	Clear	10 Y 1.1 F
33796	Soy Bean Oil	Peacock Canning Co., R. J., Lubec	E. F. Drew & Co., Inc., New York 10, N. Y.			0.028	Clear	10 Y 1.3 F
33800	Soy Bean Oil	Peacock Canning Co., R. J., Lubec	A. E. Staley Mfg. Co., Decatur, Ill.			0.021	Clear	10 Y 1.0 F

Table showing the results of the analyses of samples of oil used in packing sardines

Station number	Sample	Dealer and town	Manufacturer or wholesaler	Refractive index at 25° C.	Iodine number (Hanus)	Free fatty acids per cent	Cold Test	Color*
33819	Refined Peanut Oil	Peacock Canning Co., R. J., Portland	Durkee Famous Foods, Elmhurst, L. I., N. Y.			0.028	Very cloudy	10 y 1.3 r
33834	Peanut Oil	Peacock Canning Co., R. J., Portland	B. M. Reeves Co., Brooklyn, N. Y.			0.028	Very cloudy	5 y 1.0 r
33846	Soy Bean Oil	Peacock Canning Co., R. J., Lubec	E. F. Drew & Co., Inc., New York 10, N. Y.			0.028	Clear	10 y 1.0 r
33858	Soy Bean Oil	Peacock Canning Co., R. J., Lubec	Spencer Kellogg & Sons, Inc., Edgewater, N. J.			0.035	Clear	35 y 2.0 r
33873	Soyabean Oil	Peacock Canning Co., R. J., Lubec	A. E. Staley Mfg. Co., Decatur, Ill.			0.021	Clear	10 y 1.4 r
33874	Soyabean Oil	Peacock Canning Co., R. J., Lubec	E. F. Drew & Co., Inc., New York 10, N. Y.			0.028	Clear	10 y 1.7 r
33903	Oil	Peacock Canning Co., R. J., Portland	B. M. Reeves Co., Brooklyn, N. Y.			0.035	Very cloudy	10 y 1.3 r
33909	Soyabean Oil	Peacock Canning Co., R. J., Lubec	E. F. Drew & Co., Inc., New York 10, N. Y.			0.028	Clear	35 y 1.1 r
33910	Soyabean Oil	Peacock Canning Co., R. J., Lubec	Armour & Co., Delaware, Md.			0.014	Clear	35 y 1.1 r
33926	Peanut Oil	Peacock Canning Co., R. J., Portland	S. M. Wolf Co., New York 13, N. Y.			0.049	Very cloudy	10 y 1.4 r
33942	Soyabean Oil	Peacock Canning Co., R. J., Lubec	E. F. Drew & Co., Inc., New York 10, N. Y.			0.028	Clear	35 y 1.1 r
33946	Soya Bean Oil	Peacock Canning Co., R. J., Lubec	Armstrong Packing Co., Newark, N. J.			0.035	Clear	35 y 2.7 r
33949	Soya Bean Oil	Peacock Canning Co., R. J., Lubec	A. E. Staley Mfg. Co., Decatur, Ill.			0.015	Clear	10 y 1.0 r
33966	Aurora Brand Soya Bean Oil	Peacock Canning Co., R. J., Lubec	E. F. Drew & Co., Inc., New York 10, N. Y.			0.035	Clear	10 y 1.2 r

Table showing the results of the analyses of samples of oil used in packing sardines

Station number	Sample	Dealer and town	Manufacturer or wholesaler	Refractive index at 25° C.	Iodine number (grams)	Free fatty acids per cent	Cold Test	Color*
33988	Winterized Soy Bean Oil	Peacock Canning Co., R. J., Lubec	E. F. Drew & Co., Inc., New York 10, N. Y.			0.035	Clear	10 y 0.8 r
33992	Soya Bean Oil	Peacock Canning Co., R. J., Lubec	Armstrong Packing Co., Newark, N. J.			0.021	Clear	10 y 2.0 r
34000	Soya Bean Oil	Peacock Canning Co., R. J., Lubec	Armstrong Packing Co., Newark, N. J.			0.042	Clear	10 y 1.3 r
34001	Soya Bean Oil	Peacock Canning Co., R. J., Lubec	E. F. Drew & Co., Inc., New York 10, N. Y.			0.028	Clear	10 y 2.3 r
34062	Soya Bean Oil	Peacock Canning Co., R. J., Lubec	Spencer Kellogg & Sons, Inc., Buffalo, N. Y.	1.4729	134	0.042	Clear	10 y 1.5 r
34100	Edible Soya Bean Oil	Peacock Canning Co., R. J., Lubec	E. F. Drew & Co., Inc., New York 10, N. Y.	1.4729	133	0.035	Clear	10 y 1.2 r
34121	Edible Soya Bean Oil	Peacock Canning Co., R. J., Lubec	Spencer Kellogg & Sons, Inc., Buffalo, N. Y.	1.4729	129	0.042	Clear	10 y 1.2 r
34145	Spency Soya Bean Oil	Peacock Canning Co., R. J., Lubec	Spencer Kellogg & Sons, Inc., Buffalo, N. Y.	1.4729	131	0.028	Clear	10 y 1.3 r
34174	Soya Bean Oil	Peacock Canning Co., R. J., Lubec	E. F. Drew & Co., Inc., New York 10, N. Y.	1.4730	133	0.035	Clear	10 y 1.0 r
33972	Soya Bean Oil	Riviera Packing Co., Easiport	The Leavitt Sugar Co., Jamaica Plain, Mass.			0.035	Clear	25 y 3.0 r
33973	Cottonseed Oil	Riviera Packing Co., Easiport	The Leavitt Sugar Co., Jamaica Plain, Mass.			0.035	Clear	35 y 3.4 r
33986	Soy Bean Oil	Riviera Packing Co., Easiport	E. F. Drew & Co., Inc., Newark, N. J.			0.028	Clear	10 y 2.0 r
33987	Puritan Brand Cottonseed Oil	Riviera Packing Co., Easiport	W. H. Food Products Co., Inc., Brooklyn, N. Y.			0.035	Clear	35 y 4.3 r
33990	Olive Oil	Riviera Packing Co., Easiport	A. Pauls, New York, N. Y.	1.4671	83.4	1.10	Very slightly cloudy	+
33991	Cottonseed Oil	Riviera Packing Co., Easiport	J. B. Blood Co., Lynn, Mass.			0.056	Clear	35 y 13.0 r

* Halphen test for cottonseed oil = negative, Station No. 33990.

† Color undetermined.

Table showing the results of the analyses of samples of oil used in packing sardines

Station number	Sample	Dealer and town	Manufacturer or wholesaler	Refractive index at 25° C.	Iodine number (Hanus)	Free fatty acids per cent	Cold Test	Color*
34064	s, s Cottonseed Oil	Riviera Packing Co., Eastport	—	1.4705	112	0.042	***	35 y 4.3 r
34068	s Cottonseed Oil	Riviera Packing Co., Eastport	W. H. Food Products Co., Inc., Brooklyn, N. Y.	1.4705	114	0.042	Clear	35 y 5.2 r
34096	s Winterized Cottonseed Oil	Riviera Packing Co., Eastport	W. H. Food Products Co., Inc., Brooklyn, N. Y.	1.4706	114	0.035	Clear	35 y 5.8 r
34101	s, s Pure Spanish Olive Oil	Riviera Packing Co., Eastport	A. Faulis, New York, N. Y.	1.4675	86	0.39	Clear	†
34102	s, s Olive Oil	Riviera Packing Co., Eastport	A. Faulis, New York, N. Y.	1.4678	87	0.91	Clear	†
34115	s, s Guitar Brand Olive Oil	Riviera Packing Co., Eastport	V. Sabella & Co., Inc., New York, N. Y.	1.4673	86	0.36	Clear	†
34143	Soya Bean Oil	Riviera Packing Co., Eastport	E. F. Drew & Co., Inc., New York, N. Y.	1.4730	132	0.042	Clear	10 y 1.1 r
33870	Aurora Brand Refined Edible Soya Bean Oil	Royal River Packing Corp., Yarmouth	E. F. Drew & Co., Inc., New York, N. Y.			0.028	Clear	35 y 1.0 r
33902	Refined Winterized Peanut Oil	Royal River Packing Corp., Yarmouth	C. F. Simonis & Sons, Inc., Philadelphia, Pa.	1.4687	89.9	0.25	Very cloudy	35 y 2.7 r
33933	Soya Bean Oil	Royal River Packing Corp., Yarmouth	C. F. Simonis & Sons, Inc., Philadelphia, Pa.		109.3	0.085	Very cloudy	35 y 2.0 r
33847	Oil	Seaboard Packing Co., Lubec	E. F. Drew & Co., Inc., Boonton, N. J.			0.042	Clear	10 y 0.8 r
33918	Aurora Brand Winterized Edible Soya Bean Oil	Seaboard Packing Co., Seaboard Portland	E. F. Drew & Co., Inc., Boonton, N. J.			0.035	Clear	35 y 1.5 r
34076	Spensoy Oil	Seaboard Packing Co., Lubec	Spencer Kellogg & Sons, Inc., Edgewater, N. J.	1.4727	135	0.035	Clear	10 y 0.4 r
34039	Spensoy Oil	Seaboard Packing Co., Lubec	Spencer Kellogg & Sons, Inc., Edgewater, N. J.	1.4729	135	0.035	Clear	10 y 1.5 r
34161	Spensoy Oil	Seaboard Packing Co., Lubec	Spencer Kellogg & Sons, Inc., Edgewater, N. J.	1.4731	129	0.042	Clear	10 y 1.1 r

s Better test for peanut oil = negative, Station No. 34064; negative, Station No. 34101; negative, Station No. 34102; negative, Station No. 34115.
 *** Insufficient sample for cold test.
 † Color undetermined.

Table showing the results of the analyses of oil used in packing sardines

Station number	Sample	Dealer and town	Manufacturer or wholesaler	Refractive index at 25° C.	Iodine number (Hanus)	Free fatty acids per cent	Cold Test	Color*
33755	Refined Soya Bean Oil	Stinson Canning Co., Prospect Harbor	Armstrong Packing Co., Newark, N. J.			0.021	Clear	10 y 1.3 r
33801	Spensoy	Stinson Canning Co., Prospect Harbor	Spencer Kellogg & Sons, Inc., Buffalo, N. Y.			0.028	Clear	10 y 1.0 r
33832	Spensoy	Stinson Canning Co., Prospect Harbor	Spencer Kellogg & Sons, Inc., Edgewater, N. J.			0.028	Clear	10 y 0.9 r
33852	Spensoy Oil	Stinson Canning Co., Prospect Harbor	Spencer Kellogg & Sons, Inc., Buffalo, N. Y.			0.028	Clear	10 y 0.7 r
33859	Winterized Soya Bean Oil	Stinson Canning Co., Prospect Harbor	E. F. Drew & Co., Inc., New York 10, N. Y.			0.028	Clear	35 y 0.9 r
33919	Pensle Soy Bean Oil	Stinson Canning Co., Prospect Harbor	Spencer Kellogg & Sons, Inc., Edgewater, N. J.			0.028	Clear	10 y 1.1 r
33945	Spensoy Oil	Stinson Canning Co., Prospect Harbor	Spencer Kellogg & Sons, Inc., Edgewater, N. J.			0.035	Clear	35 y 0.9 r
33967	Spensoy Oil	Stinson Canning Co., Prospect Harbor	Spencer Kellogg & Sons, Inc., New York, N. Y.			0.042	Clear	35 y 0.8 r
33989	Spensoy Oil	Stinson Canning Co., Prospect Harbor	Spencer Kellogg & Sons, Inc., Buffalo, N. Y.			0.028	Clear	35 y 0.8 r
34085	Spensoy Oil	Stinson Canning Co., Birch Harbor	Spencer Kellogg & Sons, Inc., Buffalo, N. Y.	1.4729	136	0.028	Clear	10 y 1.0 r
34097	Soy Bean Oil	Stinson Canning Co., Prospect Harbor	Spencer Kellogg & Sons, Inc., Edgewater, N. J.	1.4729	133	0.035	Clear	10 y 1.2 r
34158	Soybean Oil	Stinson Canning Co., Birch Harbor	Spencer Kellogg & Sons, Inc., Buffalo, N. Y.	1.4732	133	0.035	Clear	10 y 1.4 r
33755	Aurora Brand Winterized Soya Bean Oil	Sunset Packing Co., Inc., West Pembroke	E. F. Drew & Co., Inc., New York 10, N. Y.			0.028	Clear	10 y 1.0 r
33797	Lotonolo Brand California Olive Oil	Sunset Packing Co., Inc., West Pembroke	A. Goldmark & Sons, New York, N. Y.			1.11	Clear	35 y 2.0 r
33831	Staley's Edsoy Oil	Sunset Packing Co., Inc., West Pembroke	A. E. Staley Mfg. Co., Decatur, Ill.	1.4672	86.7	0.021	Clear	10 y 1.2 r
33885	Sanita Helina Olive Oil	Sunset Packing Co., Inc., West Pembroke	A. Goldmark & Sons, New York, N. Y.	1.4679	84.9	0.113	Slightly cloudy	†

* Halphen test for cottonseed oil = negative, Station No. 33797; negative, Station No. 33885.

† Color undetermined.

Table showing the results of the analyses of samples of oil used in packing sardines

Station number	Sample	Dealer and town	Manufacturer or wholesaler	Refractive index at 25° C.	Iodine number (Hanus)	Free fatty acids per cent	Cold Test	Color*
33911	Aurora Brand Winterized Soy Bean Oil	Sunset Packing Co., Inc., West Pembroke	E. F. Drew & Co., Inc., New York 10, N. Y.			0.028	Clear	35 y 1.0 r
33970	Soybean Oil	Sunset Packing Co., Inc., West Pembroke	A. E. Staley Mfg. Co., Decatur, Ill.			0.028	Clear	35 y 1.0 r
34116	Edible Refined Winterized Soybean Oil	Sunset Packing Co., Inc., West Pembroke	E. F. Drew & Co., Inc., New York 10, N. Y.	1.4729	131	0.042	Clear	10 y 1.1 r
33848	Refined Winter Soybean Oil	Trident Packing Co., Inc., Portland	Armstrong Packing Co., Newark, N. J.			0.028	Clear	35 y 1.2 r
33853	Peanut Oil	Trident Packing Co., Inc., Portland	Armstrong Packing Co., Fort Newark, N. J.			0.042	Very cloudy	10 y 1.6 r
33947	Refined Decolorized Winterized Soybean Oil	Trident Packing Co., Inc., Portland	Armstrong Packing Co., Newark, N. J.			0.028	Clear	35 y 2.5 r
33717	Soybean Oil	Underwood Co., Wm., West Jonesport	Lookout Oil & Refining Co., Chattanooga, Tenn.			0.021	Clear	35 y 2.4 r
33799	Refined Edible Winterized Soybean Oil	Underwood Co., Wm., McKinley	E. F. Drew & Co., Inc., Boonton, N. J.			0.021	Clear	10 y 1.5 r
33872	Winterized Edible Soya Bean Oil	Underwood Co., Wm., McKinley	E. F. Drew & Co., Inc., Boonton, N. J.			0.028	Clear	35 y 1.0 r
33959	Soy Bean Oil	Underwood Co., Wm., McKinley	Spencer Kellogg & Sons, Inc., Boston, Mass.			0.028	Clear	10 y 1.4 r
33985	Cottonseed Oil	Underwood Co., Wm., McKinley	Armstrong Packing Co., Port Newark, N. J.			0.028	Clear	35 y 3.4 r
34157	Soya Bean Packing Oil	Underwood Co., Wm., McKinley	George W. King, N. J.	1.4728	130	0.028	Clear	10 y 1.7 r
34175	Refined Soya Bean Oil	Underwood Co., Wm., McKinley	Armstrong Packing Co., Newark, N. J.	1.4730	131	0.021	Clear	10 y 1.4 r
33767	Soybean Oil	Wilson Fisheries, B. H., Eastport	C. F. Simonius & Sons, Inc., Philadelphia, Pa.			0.056	Clear	10 y 2.7 r
33768	Peanut Oil	Wilson Fisheries, B. H., Eastport	C. F. Simonius & Sons, Inc., Philadelphia, Pa.			0.049	Very cloudy	5 y 0.8 r

Table showing the results of the analyses of samples of oil used in packing sardines

Station number	Sample	Dealer and town	Manufacturer or wholesaler	Refractive index at 25° C.	Iodine number (Hanus)	Free fatty acids per cent	Cold Test	Color*
33850	Aurora Brand Soya Bean Oil	Wilson Fisheries, B. H., Eastport	E. F. Drew & Co., Inc., New York 10, N. Y.			0.021	Clear	35 y 0.3 r
33948	Aurora Brand Refined Edible Winterized Soyabean Oil	Wilson Fisheries, B. H., Eastport	E. F. Drew & Co., Inc., New York 10, N. Y.			0.035	Clear	35 y 1.0 r
34054	^{10, 11, 12} Winterized Soy Bean Oil	Wilson Fisheries, B. H., Eastport	E. F. Drew & Co., Inc., New York 10, N. Y.	1.4731	132	0.035	Clear	10 y 1.0 r
34119	Soya Bean Oil	Wilson Fisheries, B. H., Eastport	E. F. Drew & Co., Inc., New York 10, N. Y.	1.4730	130	0.028	Clear	10 y 1.0 r
34159	^{10, 11, 12} California Pure Olive Oil	Wilson Fisheries, B. H., Eastport	Commercial Complex Co., New York, N. Y.	1.4673	84	2.33	Slightly cloudy	†

¹⁰ Halphen test for cottonseed oil = negative, Station No. 34054; negative, Station No. 34159.¹¹ Qualitative test for teaseed oil = negative, Station No. 34054; negative, Station No. 34159.¹² Bandonin test for sesame oil = negative, Station No. 34054.¹³ Beller test for peanut oil = negative, Station No. 34159.

† Color undetermined.

PICKLING COMPOUND AND VINEGAR

The Maine Food and Drug Law specifies that the word vinegar means in Maine, vinegar made from apple cider and that it cannot be used by itself to designate any other kind of vinegar. It is legal to sell all other kinds of vinegar but the products must be properly labeled. Vinegar is the product made by the alcoholic and subsequent acetous fermentations of the juice of apples and contains not less than four (4) per cent of acetic acid.

Table showing the results of the analyses of thirteen samples of pickling compound and vinegar

Station number	Sample	Dealer and town	Manufacturer or wholesaler	Grams per 100 ml			MI N acid per 100 ml
				Total acids as acetic	Total solids ash	Insoluble ash	
33734	Red Pickling Compound	Hannaford Brothers, Portland	Stickney & Poor Spice Co., Boston, Mass.	4.20	0.130	0.036	
33735	Red Pickling Compound	Hannaford Brothers, Portland	Stickney & Poor Spice Co., Boston, Mass.	4.20	0.140	0.032	
33742	Red Pickling Compound	Hannaford Brothers, Portland	Stickney & Poor Spice Co., Boston, Mass.	4.11	0.120	0.026	
33743	Red Pickling Compound	Hannaford Brothers, Portland	Stickney & Poor Spice Co., Boston, Mass.	4.23	0.120	0.032	
33744	Red Pickling Compound	Hannaford Brothers, Portland	Stickney & Poor Spice Co., Boston, Mass.	4.20	0.110	0.016	
33913	Vinegar Compound	Hyde's Market, Augusta	Somerset Vinegar Works, Auburn, Me.	4.02	0.316	0.047	0.022
33915	Distilled Spirit Vinegar	Pomelau, Charles, Waterville	Stickney & Poor Spice Co., Boston, Mass.	4.41	0.129	0.027	0.002
33924	Pure Older Vinegar	Ralph's Store, Auburn	Somerset Vinegar Works, Auburn, Me.	4.05	1.353	0.216	0.182
33921	White Vinegar	Somerset Vinegar Works, Auburn	Somerset Vinegar Works, Auburn, Me.	4.41	0.280	0.005	0.036
33922	Pure Cider Vinegar	Somerset Vinegar Works, Auburn	F. E. Jewett, Lowell, Mass.	4.02	1.537	0.241	0.200
33923	Pure Cider Vinegar	Somerset Vinegar Works, Auburn	Own make	4.02	1.354	0.211	0.174
33914	Red Pickling Compound	Super Economy Store, Waterville	Robbins & Co., Augusta, Me.	4.23	0.151	0.030	0.005
33748	Red Pickling Compound	Trumbull, C. F., Fryeburg	Hannaford Brothers, Portland, Me.	4.20	0.170	0.026	

SARDINES
Table showing the results of the examination of three samples of sardines packed in soybean oil

Station number	Brand	Manufacturer or wholesaler	Can	Appearance	Number of fish in can	Number of fish sort of broken fish	Number of fish showing presence of feed or mud in pike	Number of fish showing "broken stomachs"
3398	Lightship Brand Maine Sardines	Jonesport Packing Co., West Jonesport, Me.	A	Fair	20	10	11	
			B	Unattractive and messy	11	8	6	
			C	Unattractive and messy	14	11	7	
			D	Fair	14	5	5	
			E	Unattractive	16	12	4	
			F	Unattractive and messy	14	9	8	
			G	Unattractive	14	12	9	
			H	Unattractive and messy	13	13	7	
			I	Unattractive	15	8	9	
			J	Unattractive	15	11	7	
			A	Unattractive	11	7	5	
			B	Unattractive	20	16	3	
3378	Lightship Brand Maine Sardines	Jonesport Packing Co., West Jonesport, Me.	C	Good	13	6	2	
			D	Good	11	6	3	
			E	Fair	13	1	1	
			F	Unattractive	20	11	6	
			G	Unattractive	13	10	2	
			H	Fair	14	10	5	
			I	Fair	14	6	3	
			J	Fair	15	5	0	
			K	Fair	14	4	0	
			L	Fair	15	6	6	

Table showing the results of the examination of three samples of sardines packed in soybean oil

Station number	Brand	Manufacturer or wholesaler	Can	Appearance	Number of fish in can	Number of soft or broken fish	Number of fish showing presence of feed or mud in poke	Number of fish showing "broken stomachs"
34047	Custom House Brand Maine Sardines	Riviera Packing Co., Eastport, Me.	1	Poor	11	4		1
			2	Very poor, mushy	14	9		4
			3	Good	7	1		1
			4	Good	12	4		2
			5	Very poor, mushy	12	8		0
			6	Poor	14	6		0
			7	Fair	10	3		0
			8	Fair	17	4		0
			9	Good	4	0		0
			10	Poor	14	8		0
			11	Poor	12	4		0
			12	Good	6	0		0
			13	Poor	12	5		0
			14	Fair	10	3		0
			15	Very good	14	0		0
			16	Very good	6	0		0
			17	Good	18	0		0
			18	Very poor, mushy	13	6		0
			19	Good	7	2		0
			20	Poor	11	5		0
			21	Good	8	2		0
			22	Fair	13	0		0
			23	Good	5	0		0
			24	Fair	16	6		0
			25	Very good	4	0		0
			26	Fair	16	4		0

SHELLFISH

CLAMS

During the last season one hundred eighty-three samples of opened and unopened clams have been received and examined. Clams opened under proper conditions, washed but not soaked, show an analyses of free liquids not more than 10 per cent, solids in the drained meats not less than 18 per cent, a score not exceeding 50 or a most probable number not exceeding 2400, whichever system is used. The score or most probable number is obtained from the results of the bacteriological examination. The score on samples of unopened clams should not exceed 50, the most probable number should not exceed 2400. In this bulletin both systems of recording the results of the bacteriological examination are used. This is due to the fact that during the year a change was made to a new procedure, namely, the most probable number system, which was recommended by the American Public Health Association for the estimation of the quality of shellfish.

The results of the examinations show that twenty-one samples of opened clams were over 10 per cent free liquid, thirty-four samples were less than 18 per cent solids in drained meats, three samples exceeded 50 in score, and twenty-two samples exceeded 2400 in most probable number. Six samples of unopened clams exceeded 50 in score and seven samples of unopened clams exceeded 2400 in most probable number.

*Table showing the results of the analyses of ninety-four samples of
opened (shucked) clams*

Station number	Dealer and town	Free liquid per cent	Solids in free liquid per cent	Salt in free liquid per cent	Solids in the drained meats per cent	Total solids in sample (calculated) per cent	MPN*	Score
34088	Ackley, Robert, Cutler	8.01	3.70	0.64	17.52	16.41	0	
34082	Boynton, Jerry, Lamoine	1.34	**	**	16.80		37	
33929	Bridges, Sidney, Wells	8.66			19.22		16000†	
33757	Chadbourne, Isaiah, Wells							0
33781	Chadbourne, Isaiah, Wells	2.80			18.00		9200	
33789	Chadbourne, Isaiah, Wells	0			20.05		16000	
33804	Chadbourne, Isaiah, Wells	3.16			17.57		16000†	
33824	Chadbourne, Isaiah, Wells	2.24			18.96		620	
33839	Chadbourne, Isaiah, Wells	4.88			18.10			
33863	Chadbourne, Isaiah, Wells	4.34			17.90		110	
33931	Chadbourne, Isaiah, Wells	9.88			19.03		1700	
33952	Chadbourne, Isaiah, Wells	5.63			20.89		5400	
34022	Chadbourne, Isaiah, Wells	6.28			16.11		16000†	
34074	Chadbourne, Isaiah, Wells	5.80	4.29 *	1.23	20.46	19.52	130	
34105	Chadbourne, Isaiah, Wells	3.49	6.40	1.34	20.20	19.72	490	
34146	Chadbourne, Isaiah, Wells	6.80	4.41	1.68	20.38	19.82	78	
34166	Chadbourne, Isaiah, Wells	9.43	3.89	0.38	14.66	13.64	140	
34077	Davis, A. H., Trenton	11.35	3.91	0.55	16.76	15.80	130	
34078	Davis, Charles, Trenton	8.10	5.15	0.95	19.07	17.94	78	
34087	Davis, Nathan, East Machias	8.99	3.27	0.78	17.34	16.11	93	
34154	Grant, George B., Yarmouth	8.02	4.78	0.14	12.83	12.18	5400	
33760	Hilton, Roy, Wells	2.05			18.69		700	
33779	Hilton, Roy, Wells	2.62			18.84		16000†	
33787	Hilton, Roy, Wells	3.30			16.32		9200	
33802	Hilton, Roy, Wells	4.80			18.72		16000	
33826	Hilton, Roy, Wells	1.33			19.30			
33841	Hilton, Roy, Wells	1.00			18.46		16000†	
33832	Hilton, Roy, Wells	4.81			15.61		16000†	
33927	Hilton, Roy, Wells	3.89			19.17		280	
33950	Hilton, Roy, Wells	4.49			19.67		700	
33974	Hilton, Roy, Wells	3.24			17.91		140	
34009	Hilton, Roy, Wells	2.93	5.10	0.93	18.75	18.14	1700	
34103	Hilton, Roy, Wells	2.61	6.83	1.30	20.37	20.02	130	
34148	Hilton, Roy, Wells	2.50				19.75	230	
34168	Hilton, Roy, Wells							
34090	Huntley, Cecil B., East Machias	12.78	3.65	1.09	18.00	16.17	68	
34092	Huntley, Earl, East Machias	10.10	3.91	1.74	19.97	18.35	2200	
34089	Huntley, Ray, North Cutler	11.65	3.21	0.26	13.56	12.35	2200	

* Most probable number.

** Not determined.

† Greater than.

Table showing the results of the analyses of ninety-four samples of opened (shucked) clams

Station number	Dealer and town	Free liquid per cent	Solids in free liquid per cent	Salt in free liquid per cent	Solids in the drained meats per cent	Total solids in sample (calculated) per cent	MPN*	Score
34051	¹ Jones Sea Food Market, Inc., Bangor	21.07	3.59	0.91	15.80	13.23		
34079	Joy, Stephen, Lamoine	14.75	4.33	1.61	19.93	17.63	0	
34061	² Kent's Market, Gardiner	18.87	4.41	0.74	17.63	15.14	0	
33976	Kimball, Wesley, Wells	10.84			17.59		430	
34172	Maine Shellfish Co., Yarmouth	5.06	5.52	0.57	18.11	17.47	120	
34083	Moore, John, Lamoine	13.76	3.34	0.51	16.66	14.83	110	
34156	Morrill, Edna, Yarmouth	2.38	7.78	1.16	22.76	22.25	170	
34080	Partridge Island Weir Co., Millbridge	5.69	4.32	1.48	18.03	17.25	0	
34060	Royal Market, A. P., Freeport	3.11	5.87	1.60	20.43	19.93	490	
34059	Shaw's Preble St. Mkt., Portland	21.10	4.08	0.24	14.98	12.08	16000	
34091	Sheridan, Harold, East Machias, R.F.D.	7.81	3.22	0.53	16.83	15.79	130	
33761	Snow Canning Co., Inc., F. H., Pine Point							23
33782	Snow Canning Co., Inc., F. H., Pine Point	6.58			20.01		790	
33791	Snow Canning Co., Inc., F. H., Pine Point	15.84			12.69		530	
33806	Snow Canning Co., Inc., F. H., Pine Point	7.74			18.12		1300	
33820	Snow Canning Co., Inc., F. H., Pine Point	8.94			17.38		640	
33835	Snow Canning Co., Inc., F. H., Pine Point	8.70			17.11			330
33865	Snow Canning Co., Inc., F. H., Pine Point	6.95			18.37		16000+	
33933	Snow Canning Co., Inc., F. H., Pine Point	6.89			19.76		790	
33953	Snow Canning Co., Inc., F. H., Pine Point	7.96			18.82		330	
33979	Snow Canning Co., Inc., F. H., Pine Point	6.87			17.64		1300	
34004	Snow Canning Co., Inc., F. H., Pine Point	4.60			18.30			9200
34012	Snow Canning Co., Inc., F. H., Pine Point	5.04			19.50		1300	
34018	Snow Canning Co., Inc., F. H., Pine Point	3.80			16.73		490	
34055	Snow Canning Co., Inc., F. H., Pine Point	6.19	5.01	1.44	19.45	18.56	78	
34065	³ Snow Canning Co., Inc., F. H., Pine Point	4.60	3.76	0.41	14.39	13.90	0	
34066	⁴ Snow Canning Co., Inc., F. H., Pine Point	5.30	5.22	0.36	17.83	17.17	78	
34081	⁵ Snow Canning Co., Inc., F. H., South Gouldsboro	1.84	**	**	22.10		0	
34108	Snow Canning Co., Inc., F. H., Pine Point	3.18	5.81	1.01	18.67	18.23	1100	
34150	Snow Canning Co., Inc., F. H., Pine Point	4.78	4.42	1.55	18.88	18.19	230	

¹ Purchased of Randolph Smallege, Ellsworth, Me.² Purchased of C. D. Batchelder, Gardiner, Me.³ Purchased of W. C. Robinson, Harrington, Me.⁴ Purchased of John Tarbox, South Gouldsboro, Me.⁵ Clams shucked by George Daley, South Gouldsboro, Me.

Table showing the results of the analyses of ninety-four samples of opened (shucked) clams

Station number	Dealer and town	Free liquid per cent	Solids in free liquid per cent	Salt in free liquid per cent	Solids in the drained meats per cent	Total solids in sample (calculated) per cent	MPN*	Score
34163	Snow Canning Co., Inc., F. H., Pine Point	4.99	4.71	1.32	18.59	17.90	330	0
33764	Thurston & Bayley, Pine Point							
33784	Thurston & Bayley, Pine Point	5.59			19.24		1800	
33793	Thurston & Bayley, Pine Point	7.60			21.08		3500	
33803	Thurston & Bayley, Pine Point	4.75			20.27		16000	
33822	Thurston & Bayley, Pine Point	4.66			20.06		16000†	110
33837	Thurston & Bayley, Pine Point	11.21			19.90		16000†	
33807	Thurston & Bayley, Pine Point	11.44			19.51		16000†	
339 5	Thurston & Bayley, Pine Point	10.16			23.81		16000†	
33955	Thurston & Bayley, Pine Point	7.36			20.72		45	
33981	Thurston & Bayley, Pine Point	8.80			18.38		330	
34006	Thurston & Bayley, Pine Point	12.39			15.76			
34014	Thurston & Bayley, Pine Point	5.07			18.64		490	
34020	Thurston & Bayley, Pine Point	4.04			18.32		68	
34069	Thurston & Bayley, Pine Point	5.00	5.29	0.80	17.37	16.77	40	
34070	⁶ Thurston & Bayley, Pine Point	9.10	4.22	0.28	14.46	13.53	20	
34111	Thurston & Bayley, Pine Point	6.27	5.04	1.07	19.13	18.25	20	
34153	Thurston & Bayley, Pine Point	4.87	4.11	1.04	18.47	17.57	78	
34165	Thurston & Bayley, Pine Point						78	
34029	⁷ Underwood Co., Wm., West Jonesport	26.21			21.55			5400
34030	⁸ Underwood Co., Wm., West Jonesport	13.33			18.19			
34031	⁹ Underwood Co., Wm., West Jonesport	23.65			12.62			
34032	¹⁰ Underwood Co., Wm., West Jonesport	16.28			15.37			
34033	¹¹ Underwood Co., Wm., West Jonesport	18.77			17.54			
34023	Wolfe, William, Wells Beach	8.85			14.89			
34058	Wolfe, William, Wells Beach	16.66	2.67	0.82	12.30	10.70	170	

⁶ Purchased of Hazen Derap, Hancock, Me.

⁷ Purchased of A. Dawes, Jonesport, Me.

⁸ Purchased of Leo Alley, Jonesport, Me.

⁹ Purchased of William Merchant, Beals, Me.

¹⁰ Purchased of Merrill Beale, Beals, Me.

¹¹ Purchased of John Fish, Jonesport, Me.

Table showing the results of the analyses of eighty-nine samples of unopened clams

Station number	Dealer and town	MPN*	Score
33930	Bridges, Sidney, Wells	790	
34107	Bridges, Sidney, Wells		130
33758	Chadbourne, Isaiah, Wells		0
33790	Chadbourne, Isaiah, Wells	700	
33805	Chadbourne, Isaiah, Wells	1100	
33825	Chadbourne, Isaiah, Wells	490	
33840	Chadbourne, Isaiah, Wells	130	
33864	Chadbourne, Isaiah, Wells	170	
33932	Chadbourne, Isaiah, Wells	220	
34075	Chadbourne, Isaiah, Wells	110	
34106	Chadbourne, Isaiah, Wells		110
34147	Chadbourne, Isaiah, Wells	78	
34167	Chadbourne, Isaiah, Wells	490	
33795	Doughty, Ernest, Falmouth	260	
33810	Doughty, Ernest, Falmouth	3500	
33811	Doughty, Ernest, Falmouth	1700	
33828	Doughty, Ernest, Falmouth	16000†	
33829	Doughty, Ernest, Falmouth	16000†	
33830	Doughty, Ernest, Falmouth	16000†	
33843	Doughty, Ernest, Falmouth	16000	
33844	Doughty, Ernest, Falmouth	1300	
33937	Doughty, Ernest, Falmouth	78	
33938	Doughty, Ernest, Falmouth	2400	
33957	Doughty, Ernest, Falmouth	110	
33982	Doughty, Ernest, Falmouth	330	
34010	Doughty, Ernest, Falmouth	330	
34016	Doughty, Ernest, Falmouth	78	
34025	Doughty, Ernest, Falmouth	170	
34113	Doughty, Ernest, Falmouth		78
34114	Doughty, Ernest, Falmouth		3500
34170	Doughty, Ernest, Falmouth	20	
34171	Doughty, Ernest, Falmouth	78	
34155	Grant, Howard, Yarmouth	0	
33759	Hilton, Roy, Wells		2
33780	Hilton, Roy, Wells	45	
33788	Hilton, Roy, Wells	490	
33803	Hilton, Roy, Wells	5400	
33827	Hilton, Roy, Wells	1700	
33842	Hilton, Roy, Wells	1300	
33861	Hilton, Roy, Wells	16000†	
33928	Hilton, Roy, Wells	230	
33951	Hilton, Roy, Wells	130	
33975	Hilton, Roy, Wells	790	
34008	Hilton, Roy, Wells	220	
34073	Hilton, Roy, Wells	310	
34104	Hilton, Roy, Wells		230
34149	Hilton, Roy, Wells	130	
34169	Hilton, Roy, Wells	220	
33977	Kimball, Wesley, Wells	790	
34173	Maine Shellfish Co., Yarmouth	170	
33821	Snow Canning Co., Inc., F. H., Pine Point	700	
33762	Snow Canning Co., Inc., F. H., Pine Point		1
33783	Snow Canning Co., Inc., F. H., Pine Point	140	
33792	Snow Canning Co., Inc., F. H., Pine Point	1300	
33807	Snow Canning Co., Inc., F. H., Pine Point	20	
33836	Snow Canning Co., Inc., F. H., Pine Point	270	
33866	Snow Canning Co., Inc., F. H., Pine Point	790	
33934	Snow Canning Co., Inc., F. H., Pine Point	230	
33954	Snow Canning Co., Inc., F. H., Pine Point	230	
33978	Snow Canning Co., Inc., F. H., Pine Point	40	

* Most probable number.

† Greater than.

Table showing the results of the analyses of eighty-nine samples of unopened clams

Station number	Dealer and town	MPN*	Score
34005	Snow Canning Co., Inc., F. H., Pine Point	0	
34013	Snow Canning Co., Inc., F. H., Pine Point	40	
34019	Snow Canning Co., Inc., F. H., Pine Point	110	
34056	Snow Canning Co., Inc., F. H., Pine Point	220	
34067	Snow Canning Co., Inc., F. H., Pine Point	0	
34068	Snow Canning Co., Inc., F. H., Pine Point	20	
34109	Snow Canning Co., Inc., F. H., Pine Point		0
34110	Snow Canning Co., Inc., F. H., Pine Point		83
34151	Snow Canning Co., Inc., F. H., Pine Point	0	
34164	Snow Canning Co., Inc., F. H., Pine Point	110	
33763	Thurston & Bayley, Pine Point		0
33785	Thurston & Bayley, Pine Point	0	
33794	Thurston & Bayley, Pine Point	78	
33809	Thurston & Bayley, Pine Point	490	
33823	Thurston & Bayley, Pine Point	130	
33838	Thurston & Bayley, Pine Point	45	
33868	Thurston & Bayley, Pine Point	1100	
33936	Thurston & Bayley, Pine Point	330	
33956	Thurston & Bayley, Pine Point	490	
33980	Thurston & Bayley, Pine Point	45	
34007	Thurston & Bayley, Pine Point	1300	
34015	Thurston & Bayley, Pine Point	20	
34021	Thurston & Bayley, Pine Point	170	
34057	Thurston & Bayley, Pine Point	230	
34071	Thurston & Bayley, Pine Point	490	
34072	Thurston & Bayley, Pine Point	130	
34112	Thurston & Bayley, Pine Point		0
34152	Thurston & Bayley, Pine Point	78	
34024	Wolfe, William, Wells Beach	230	

MUSSELS

In recent years mussels have been canned commercially in Maine. Last season, due to the fact that toxic mussels had been found by Canadian authorities in the Bay of Fundy area, some concern was felt as to whether this condition extended to the Maine waters. An investigation was made by the Maine Division of Inspection in conjunction with the Federal Food and Drug Administration. The results of analyses of thirty official samples of mussels show them to be nontoxic. In addition to these samples thirty-three samples of extract from mussels were examined for the Federal Food and Drug Administration.

*Table showing the results of the analyses of thirty samples
of mussels*

Station number	Dealer and town	Sampled at	Mouse units of toxin per 100 grams of meat
33983	Black & Gay Canning Co., Thomaston	Maple Juice Cove, North	Less than 200
33984	Black & Gay Canning Co., Thomaston	Maple Juice Cove, West	Less than 200
33770	North Atlantic Packing Co., Bar Harbor	Thomas Bay, Trenton	Less than 200
33771	North Atlantic Packing Co., Bar Harbor	Sullivan	Less than 200
33772	North Atlantic Packing Co., Bar Harbor	Thomas Bay, Trenton	Less than 200
33964	North Atlantic Packing Co., Bar Harbor	Berry Cove, Lamoine	Less than 200
33965	North Atlantic Packing Co., Bar Harbor	Lamoine Beach, Lamoine	Less than 200
33769		Stave Island Bar, South Gouldsboro	Less than 200
33876		Dog Island, Eastport	Less than 200
33877		Moose Island Bridge, Perry	Less than 200
33878		Pleasant Point	Less than 200
33879		Gleason's Cove, Perry	Less than 200
33880		Pigeon Hill, Steuben	Less than 200
33881		Stave Island Bar, South Gouldsboro	Less than 200
33883		M. Desert Island	Less than 200
33884		Lamoine	Less than 200
33888		Mouse Island, Beals Island	Less than 200
33889		Sheep Island, Beals Island	Less than 200
33890		Great Ledge, Beals Island	Less than 200
33891		Doyel's Island, Addison	Less than 200
33892		Cook's Island, Addison	Less than 200
33893		Cummings Creek, Jonesport	Less than 200
33894		Center Harbor, Brooklin	Less than 200
33895		Bridge, Bluehill Falls	Less than 200
33896		Frank Stover's Point, Bluehill	Less than 200
33897		Surry	Less than 200
33898		Keene Narrows, Orr Island	Less than 200
33899		Keene Narrows, Orr Island	Less than 200
33900		Belfast	Less than 200
33901		Gilkey's Wharf, Searsport	Less than 200

OYSTERS

Properly drained and reasonably fresh opened oysters in good condition for food will not contain more than 5 per cent of liquids that will drain from a colander in five minutes and will not have less than 16 per cent of solids in the drained meats.

The results of the analyses show that the majority of the samples, reported in the following table, were adulterated by soaking in water.

Table showing the results of the analyses of seventeen samples of raw oysters

Station number	Dealer and town	Manufacturer or wholesaler	Free liquid per cent	Solids in free liquid per cent	Salt in free liquid per cent	Solids in the drained meats per cent	Total sol in samp (calculated per cent)
34036	Columbia Mkt., Inc., Portland	The J. M. Clayton Co., Cambridge, Md.	20.11	4.76	0.24	12.22	10.72
34037	First National Stores, Inc., Portland	John Leonard, Baltimore, Md.	25.09	3.97	0.07	11.12	9.33
34039	First National Stores, Inc., South Portland	John Leonard, Baltimore, Md.	25.29	7.49	0.002	13.34	11.80
34052	First National Stores, Inc., Bangor	John Leonard, Baltimore, Md.	32.26	3.66	0.09	10.89	8.55
34038	Flaherty, M. J., Portland	H. Allen Smith, Oberiton, Va.	21.59	3.84	0.39	11.66	9.97
34041	Hamilton Bros., Portland	Chas. Neubert & Co., Baltimore, Md.	22.65	3.55	0.09	11.46	9.66
34050	Jones Sea Food Mkt., Inc., Bangor	Blue Points Co., Inc., West Sayville, Long Island, N. Y.	36.55	3.29	0.18	13.97	10.06
34043	Kents Mkt., Gardiner	The J. M. Clayton Co., Cambridge, Md.	21.92	3.28	0.52	13.36	11.15
34044	Martin's Mkt., Gardiner	L. R. Carson, Crisfield, Md.	42.86	3.07	0.20	12.27	8.33
34040	Miller R. O., South Portland	O. E. Wentworth, Baltimore, Md.	26.01	3.87	0.09	11.26	9.33
34045	Packard & Brown, Augusta	The J. M. Clayton Co., Cambridge, Md.	9.84	4.87	0.43	15.05	14.05
34046	Packard & Brown, Augusta	Wm. B. Durn & Co., Inc., Baltimore, Md.	19.17	3.23	0.02	9.92	8.64
34048	Peoples Fish Mkt., Inc., Bangor	Warren Oyster Co., Inc., Warren, R. I.	9.24	8.28	0.51	19.30	18.29
34049	Peoples Fish Mkt., Inc., Bangor	The J. M. Clayton Co., Cambridge, Md.	23.29	3.88	0.22	11.62	9.81
34034	Shaw's Preble St. Mkt., Portland	O. E. Wentworth, Baltimore, Md.	27.43	3.06	0.07	10.48	8.45
34035	Woods & Cushing, Portland	The J. M. Clayton Co., Cambridge, Md.	16.24	4.75	0.39	13.43	12.02
34042	_____	I. L. Leonard & Co., Cambridge, Md.	24.47	3.79	0.28	12.99	10.74

DILUTED HYDROCHLORIC ACID

Diluted hydrochloric acid is an aqueous solution containing in each 100 c.c. not less than 9.5 grams and not more than 10.5 grams of hydrochloric acid. Ten samples were collected and submitted for analysis. One sample exceeded the maximum standard and three samples were below the minimum standard.

Table showing the results of the analyses of samples of diluted hydrochloric acid

Station number	Dealer and town	Manufacturer or wholesaler	Grams hydrochloric acid in 100 c.c.
33725	Cape Shore Pharmacy, South Portland	Mallinckrodt Chemical Works, New York, N. Y.	9.96
33736	Cummings Drug Store, Portland	Mallinckrodt Chemical Works, New York, N. Y.	10.07
33730	Dow's Drug Store, South Portland	Mallinckrodt Chemical Works, New York, N. Y.	10.00
33703	LaChance Drug Store, Westbrook	Walgreen Co., Chicago, Ill.	10.80
33726	Legion Square Pharmacy, Cape Elizabeth	Own make	9.33
33740	Lord's Pharmacy, Portland	Mallinckrodt Chemical Works, New York, N. Y.	10.00
33700	Miller's Pharmacy, Westbrook	Own make	9.89
33699	Paine, L. K., Westbrook	Own make	5.02
33723	Stevens Drug Store, Portland	Own make	9.20
33702	Vallee Pharmacy, The, Westbrook	Mallinckrodt Chemical Works, New York, N. Y.	9.96

SPIRIT OF CAMPHOR

Spirit of camphor is an alcoholic solution containing in each 100 c.c. not less than 9.2 grams and not more than 10.4 grams of camphor, at 25° C. The four samples which were received for analysis complied with the standard.

*Table showing the results of the analyses of samples of
spirit of camphor*

Station number	Dealer and town	Manufacturer or wholesaler	Camphor grams in 100 c.c.
33727	Cottage Road Pharmacy, South Portland	United Drug Co., Boston, Mass.	10.40
33775	Daviau Pharmacy, The, Waterville	EH Lilly & Co., Indianapolis, Ind.	10.40
33741	Malia Drug Store, Portland	EH Lilly & Co., Indianapolis, Ind.	10.40
33729	Wilson Drug Store, South Portland	Brewer & Co., Inc., Worcester, Mass.	10.00

SPIRIT OF PEPPERMINT

Spirit of peppermint contains in each 100 c.c. not less than 9 c.c. and not more than 11 c.c. of oil of peppermint. The eleven samples, which were received for analysis, complied with the standard.

Table showing the results of the analyses of samples of spirit of peppermint

Station number	Dealer and town	Manufacturer or wholesaler	Oil of peppermint c.c. in 100 c.c.
33731	Anderson's Pharmacy, South Portland	Purepac Corporation, New York, N. Y.	10.80
33728	Beane Pharmacy, Austin C., South Portland	Eli Lilly & Co., Indianapolis, Ind.	10.80
33773	Daviau Pharmacy, The, Waterville	Baker Drug Corp., Norfolk, Va.	10.80
33774	Daviau Pharmacy, The, Waterville	Baker Drug Corp., Norfolk, Va.	10.80
33737	Deering Drug Co., Portland	Schlotterbeck & Foss, Portland, Me.	9.60
33701	Hood's Drug Store, Westbrook	Brewer & Co., Inc., Worcester, Mass.	10.40
33738	Jackson Drug Store, Portland	J. E. Gould & Co., Portland, Me.	10.40
33724	Legion Square Pharmacy, South Portland	Eli Lilly & Co., Indianapolis, Ind.	10.40
33733	Taylor Drug Co., South Portland	Eli Lilly & Co., Indianapolis, Ind.	10.40
33732	Ward's Drug Store, South Portland	United Drug Co., Boston, Mass.	10.80
33739	Winship Pharmacy, Portland	United Drug Co., Boston, Mass.	10.80

MISCELLANEOUS MATERIALS

34178. Dietetic Beverage.
 Dealer: Spangler's Market, Bangor
 Manufacturer or wholesaler: Robert H. Haskins & Son, Esmond, R. I.
 Marks: Saccharin Sweetened Dietetic Beverage—Ginger Ale.
 Net contents 12 fl. oz.
 Found: Net contents 13 fl. oz.
 Saccharin 0.034 grain per fl. oz.
33684. Imitation Olive Oil
 Dealer: Columbia Market, Inc., Portland
 Manufacturer or wholesaler: Gold N Oils, Inc., Boston, Mass.
 Marks: Ingredients Cotton Seed Oil, Butyric Acid Esters,
 Essential Oils, Artificially Colored.
 Found: Refractive index at 25° C. 1.4721
 Free fatty acids as oleic 0.035%
 Halphen test for cottonseed oil positive
 Color 35 yellow, 2.1 red
 Iodine number (Hanus) 127.4

